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ABSTRACT

This volume contains 53 articles grouped under five headings: (1) Research (14 papers on such topics as cognitive style and cognitive strategies, visual literacy training, and the impact of diagrams, type styles, and computer graphics on learning); (2) Theory (nine papers on such topics as the development of visual literacy concepts, cognition and understanding, visual intelligence, instructional design, and hypermedia); (3) Computers and Technology (six papers on such topics as hypermedia, still photography, high definition television, and desktop publishing); (4) Arts (12 papers on such topics as photography, images and meaning, incongruous imagery, visual thinking, and art and computer graphics); and (5) Schools and Curriculum (12 articles on such topics as teaching visual literacy at the elementary, high school, and college levels, illustration of children's books, visual creativity, visual design, and schema construction). Most papers contain references. (KRN)

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Investigating Visual Literacy

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INVESTIGATING VISUAL LITERACY

Selected Readings from the 22nd Annual Conference of the International Visual Literacy Association

Edited by

Darrell G. Beauchamp
Judy Clark Baca
Roberts A. Braden

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Referee Procedure

This book of readings consists of selected papers presented at the 22nd Annual Conference of the International Visual Literacy Association. The selection process for inclusion in this book of readings was as follows:

1. Proposals submitted in response to a call for papers were referred to a committee who screened the proposals and either accepted or rejected them based upon criteria for presentation at the conference.
2. Each of the selected presenters were invited to submit a paper for evaluation by an editorial board who decided which papers would appear in the book of readings. This decision was made based upon the clarity, timeliness, and appropriateness of the topic presented.
3. Each paper accepted by the editorial board was edited and returned to the author for revising.
4. Final, camera-ready copy was returned to the editors and published in this book of selected readings.

The editors wish to thank the members of the conference planning committee for their hard work in preparation for the 22nd annual conference and the members of the screening committee for their hard work in the selection of the papers for presentation and ultimately this book of readings.

Members of the 1990 presentation/paper screening committee:

Forrest Wisely, Illinois State University
Rhonda Robinson, Northern Illinois University
Jim Bradford, Illinois State University

Members of the 1990 conference executive planning committee:

Forrest Wisely, Jim Bradford, Dorothy Kennett

Editorial Board:
Forrest Wisely
James Bradford
Dorothy Kennett

Acknowledgements

Each year it gets harder and harder to remember all the many people helpful in bringing this project to closure. Many spend countless hours in an effort to make this a quality publication. The editors hope they have succeeded. Special thanks go out to:

The authors of the articles and presentations for their commitment to quality. Especially noteworthy are those who took time to learn a new word processing package just so a majority of these papers could be formatted in two column;

The organizers of the 22nd Annual Conference of the International Visual Literacy Association held in Bloomington/Normal, Illinois;

Dr. Selvin Royal, Dr. Jody Charter, Dr. Glenda Thurman, and Mrs. Leta Stroud of the Department of Educational Media and Library Science at the University of Central Arkansas for both their logistical and moral support;

Joe Hundley and Billina Matthews and **The Center for Academic Excellence**, for their continued support of projects like these;

The College of Education and the **University of Central Arkansas** for their logistical and technical support;

Bob and Ann Cantrell, Cantrell Printing, Conway, Arkansas for their insistence that this printing job not be average;

and

Again, as always, **Dr. Beverly Braden** for the many warm and loving gifts of sustenance and support during the long hours of putting it all together.

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We Did It Our Way: Guidelines for Manuscript Format

Editors' Note:

The paper that follows, *We Did It Our Way: Guidelines for Manuscript Format*, is an edited version of a paper sent to each of the authors whose work is published in this book. Readers are encouraged to thumb through the book itself and decide how much effect that paper has had on the overall appearance of this volume. Those of you who have read earlier volumes published by IVLA will likely conclude that there is much more uniformity in the formatting of papers in the current volume than in those of the past.

Does it matter? We think so. Several years ago we coined the term "the look of the book." Printing conventions, visual cues in text, use of illustrations to compliment the written word, and other things that affect the look of the book seem to us to be important visual literacy considerations. If we did not care about readability, legibility, neatness and appearance, and all else that enhances the look of the book, then our vision of visual literacy would be a narrow one indeed. Consequently we have attempted to help our authors help us improve the visual impressions that the readers will be given by this collection of papers.

We would be remiss if we failed to acknowledge how much help the cooperation of the authors in following our guidelines has been. Spelling checkers have reduced our search for things to be corrected, but the efforts of our authors have been even more valuable. In years past we have spent days on end cutting, pasting, reducing, enlarging, laying out, and cleaning up the submissions of the contributors to the IVLA books of readings. This year it was a piece of cake -- well, almost. For many of this year's contributors, preparing a manuscript in two columns was a new experience -- and not a piece of cake. We owe them a special expression of our appreciation. **Thank you, authors.**

-- R. A. B., J. C-B., D. G. B. --

We Did It Our Way: Guidelines for Manuscript Format

Judy Clark Baca
Roberts A. Braden
Darrell G. Beauchamp

The book of readings which results from the work of the participants in the IVLA Conference is one of the major ways of disseminating current research and ideas concerning visual literacy. The annual volume has grown tremendously in the past few years in both size and quality. The pervasiveness of computers, word processing software, and laser printers provides tools that enable us to continue improving the "look of the book." Doing so should also enhance the image of the organization.

The IVLA Readings are published on an austere budget so that the selling price of the book can be kept as low as possible. All of the articles are, therefore, reproduced *exactly as submitted by the authors in final, camera-ready copy.* For the past few years, authors have received brief page layout guidelines which included margin widths and print size and quality. Uniform margins and page layout together with letter-quality type create a consistent look and improve the book's appearance.

The editors have been very gratified by the contributors' willingness to adhere to these guidelines and to make requested revisions. The editors believe that we have reached the point where we can continue upgrading this appearance by providing further guidelines which will allow the final volume of readings to have a much more polished, professional look. This paper was written in order to explain those guidelines and to provide an example of their application.

Contents

1. Page layout
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6. Dates and deadlines

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Page Layout

A page layout which is uniform from article to article provides a consistent style for the book. The guidelines below should be used for formatting the paper, i.e., deciding margin width, line spacing, paragraph indenting, page numbering, and whether to use columns.

Margins

All pages should have 1.5 inch left margins, 1 inch right margins, 1 inch bottom margins. The top margin should be 1 inch on all pages except the first. This will produce a page of text which is 9 inches long (except on the first page) and six inches wide. The editors have provided each conference author with a transparency overlay dsigned to be used to measure margins. Simply fill the box and watch for margins.

First Page

On the first page, use a special top margin. Have the text begin 3.5 inches from the top edge of the paper rather than one inch from the top. The extra 2.5 inches of space will be used for the title and the author's name. In case you're wondering, the title and byline will be added by the editors when the manuscript is assembled. Subsequent pages should be formatted by the authors to follow the margin rules stated above.

Spacing

Single space the text and double space between paragraphs. If you decide to leave an extra space before or after headings and subheadings (optional), be consistent throughout your paper. Ideally, there should be five and a half lines per inch in a paragraph of single spaced text.

Indenting

Indent paragraphs between one-third and one-half inch. Depending on the software you are using, this can probably be done either through paragraph formatting or by setting the default tab width.

Page Numbers

Do not number the pages. Pagination will be added after the book is assembled. However, the editors are sometimes clumsy. So, in case we drop your paper, please use pencil and **lightly** mark page numbers on the back of every page. Also, please lightly pencil the authors name(s) on the back of each page.

Columns

Research evidence is clear on the value of breaking printed text into columns. In simple terms, readers find it easier to read text in three inch lines than in six inch lines (Pettersson, 1989). Therefore, it is the editors' *recommendation* that a two-column format be used. The space between the columns should be .35 inch. Of course, if your word processor doesn't do columns, don't fret. Format your paper with six inch lines.

Justification

We like the look of the two-column format when the text is justified on both edges. However, in order to avoid leaving large, inconsistent spaces between words (and sometimes letters), you must use a font with proportional spacing if you right justify the text. If you are using a font which does not have proportional spacing (such as *Courier*), leave the right edge ragged rather than justified.

Type

Font Style, Type Faces, and Type Size

Our first choice of fonts for body text is any highly readable **proportional spaced** font with serifs, such as *Times Roman*, *Dutch*, *Bodoni*, *Charter*, or *Century Schoolbook*. This text font is Dutch which is Bitsteam's version of Times Roman. The name doesn't matter. Go by the "look" or appearance of the font. The font sizes that we like are 11 or 12 point set five and a half lines per inch. Close combinations are acceptable, such as 11 point at 6 lines per inch or 12 point at 5 lines per inch. Our second choice font would be one that is proportional spaced without serifs, such as *Helvetica*, *Letter Gothic*, or *Swiss*.

Print Quality

Laser printed text is good. Letter quality printed text is not as good, but readable. However, for the professional quality for which we are striving in this book, it is out of place and out of date. (We won't even discuss near-letter-quality or simple dot matrix printing.) Last year, most of our authors submitted their final manuscripts in laser printed form. Our goal this year is to have **ALL** manuscripts laser printed.

The diversity of the professionals involved in IVLA is one of the strengths of the organization. We recognize that in addition to different backgrounds, interests, and areas of expertise, there is a difference in the resources available to the members and that not every author will have access to a laser printer. If you cannot get your paper laser printed, please contact Darrell Beauchamp at (501) 450-3177 so that we can help make alternative arrangements for the printing of your paper. Please do this early in the writing process in order to preserve as many options as possible.

Visual Enhancements

The Visual Challenge

The majority of papers published in the IVLA annual books of readings are made up of words only. Where are the pictures? Where are the charts? Where are the diagrams? Where are the line drawings: We keep wondering why **visual literacy** authors do their **literate** thing (writing) without **visuals**. Some answers to this mystery come to mind:

1. It is more work to format a paper with inserted visuals.

2. Creating the visuals isn't always easy.

3. The text oriented academic world has intimidated us. Is a paper with pictures less scholarly than one without?

4. Visual literacy-authors aren't necessarily visually literate. [Good grief!]

5. There is a conspiracy. *The Grinch stole Christmas and his relatives have absconded with the visuals.*

Several problems are associated with multiple pages of text. One is that large amounts of text tend to become gray in their appearance (and thus are boring and harder to read). The editors have found that several methods my be effectively used to reduce grayness. Figures, tables, photographs and illustrations are, of course, wonderful answers to the gray problem. Other methods include headings, subheadings, white space like this [

], and type enhancement such as **BOLD**, *italic*, $^{\text{superscript}}$, $_{\text{subscript}}$, and underline.

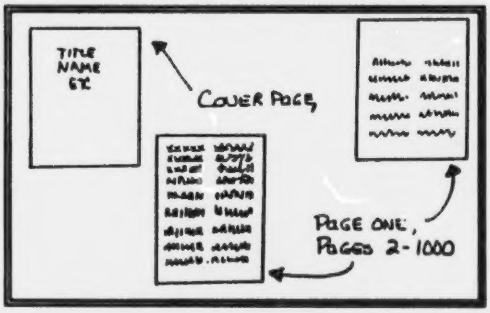
We encourage you to put your ideas in visual form and include those visual elements such as illustrations, photographs, charts and tables. Guidelines for their inclusion and use of other visual enhancement techniques follow.

Figures, Tables and Illustrations,

Illustrations, figures, and tables should be inserted in the text where you want them to appear. Please do not mark the text "insert figure here" and put them at the back of your manuscript. That requires that the text be reprinted with the appropriate amount of space left for the visual. Since you are doing the printing, please also place the visuals.

All visuals should be camera ready. If you have had to reduce or enlarge a table or figure on a copier, please check the quality to make sure it is satisfactory. The method of printing which we use does not provide good copies of photographs unless the photographs are printed with a half tone screen. Authors who wish to include photographs with their article should check with the editors if providing that is not possible.

Hey! Even hand drawn sketches help us communicate. For example, we want authors to place the title of their paper on a cover sheet, to start the body text on the first page two and a half inches below the normal top margin, and to have a normal top margin of one inch. Like this:



Headings and subheadings

The use of headings and subheadings not only reduces a great deal of the gray look of a paper but allows the reader ease in finding information while forcing the author to be organized. We recommend the use of headings and subheadings following the guidelines of the APA style manual. Remember, consistency in placement is important.

Copyright Consideration

Quoting extensively from one source or using illustrations, figures, or photographs from a previously printed source raises the issue of copyright. Please refer to the APA manual and follow the guidelines given therein. If your use of copyrighted material requires a signed copyright release, please provide a copy with your manuscript. Also, note that even figures which you originally produced may require copyright release if they have been printed in another source and the copyright has been transferred to that publisher.

Submitting the Manuscript

The editing process

All manuscripts submitted for the IVLA Readings are read and edited by at least three individuals. Thus the editors hope that each author will submit four copies of their initial manuscript. Although most authors will make minor revisions to their paper as a result of the editing, it is requested that initial manuscripts be prepared as if they were in final form. To do so lets the editors "visualize" what the final paper will look like when printed in the book. It would be a further courtesy if a disk accompanied the manuscript, permitting the editors to make minor corrections when circumstances dictate.

Software availability

The editors have available an assortment of DOS-based word processing packages, including Word, PFS Write, Multimate, Word Perfect, and WordStar. In a pinch we can borrow a Macintosh.

Cover page and titles

Please put the title on a separate cover page. Also list your name as you wish it to appear, your mailing address, and your home and work phone numbers. If there is more than one author, please designate a contact person so that all correspondence be addressed to him or her.

Style manuals

We realize that there are several professional reference style guides which researchers use to guide the writing of their papers. We prefer the style manual of the APA and believe it to be the one used by a majority of the IVLA membership. Therefore, if you know APA, use it. If you don't know APA, use the one you know but please be consistent.

Dates and Deadlines

Since one of our goals is to have the finished product ready in time for the AECT Conference in Orlando, we find it necessary to set a few important deadlines. We will expect each author to bring FOUR copies of her/his paper to the IVLA Conference in Bloomington/Normal. There we will have a box in which to collect the papers. We will expect the box to be full by conference end. Included with the papers should be the disk (if possible, and clearly marked with file name and word processing package).

The edited papers will be returned to the authors no later than the week following Thanksgiving. All changes and corrections should be made and returned to the editors no later than December 12. Hopefully, these deadlines will enable us to meet the overall deadline of AECT.

Summary

It is our hope that these guidelines will assist the authors in the preparation of their IVLA manuscripts. We have not only outlined our needs but have also tried to demonstrate our intentions with a finished product.

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RESEARCH

Animated Visuals and the Learning of Dynamic Processes from Microcomputer-Based Instruction

Gary B. Mayton

The use of visual information in instructional materials delivered by microcomputers continues to grow in diversity. In both the form of the graphic message and the instructional purpose for its inclusion, instructional designers are likely to exercise the increasing capability (from improved memory, processing times, and functionality) that current and future hardware and software systems can afford. How educators use variations of visual forms in instructional systems and how they match these forms to various learning outcomes should increase in interest as well. As a result, disciplined investigation of the instructional impacts contributed by the use of the wide variety of available, applied visual forms is justifiably increasing.

One such visual form which continues to grow in availability and popularity is that of the animated graphic. Animation, the rapid display of slightly varied images in order to produce a continuous sequence of an object(s) in motion, brings a special combination of potentials to the visual world. Producing a moving sequence of images enables one to add the fourth dimension of time to a visual scene. Such an attribute allows the depiction of multivariate changes in an event(s) over time. Also, individual animation images (frames) are typically created through hand-drawn, modeled/sculpted, or computer-rendered means. Such a process affords a special attention to detail and precision. For similar reasons, the animation process permits the rendering of scenes that could be difficult, dangerous, or impossible to depict by traditional photographic, cinematic, or videographic techniques. In light of this combination of attributes, it is anticipated here that animation would be instructionally attractive for presenting information about dynamic processes which occur in unseen places.

This study was conducted to investigate the effects of the animation of visual information when used in conjunction with text and static visuals in microcomputer-based instruction. Of particular interest was consequent performance on higher level learning tasks as a result of viewing these forms of visual presentation. The specific interest was on those levels of learning that demonstrate knowledge of a dynamic process.

In addition to comparisons of contrasting forms of instructional presentations (i.e., animated versus static visuals), attention was also paid to some other presumably relevant factors in this study. Focus on the learning of dynamic processes from animation-enhanced instruction also included attention to forms of microcomputer-based materials which did and did not employ an externally-imposed, visualization strategy, to testing in both graphic- and text-based formats, and to retention of learning.

Hypotheses

Stated in the null form, the following hypotheses were tested:

Ho_1. Persons exposed to animated graphics (used with static visual images and text) in microcomputer-based instruction will not score significantly higher than persons receiving microcomputer-based instruction using static visual images and text alone on cued-recall tests of dynamic processes and related complex concepts when the performance measures are taken immediately following presentation of instruction.

Ho_2. Persons exposed to animated graphics (used with static visual images and text) in microcomputer-based instruction will not score significantly higher than persons receiving microcomputer-based instruction using static visual images and text alone on cued-recall tests of dynamic processes and related complex concepts when the performance measures are taken following a one-week delay after presentation of instruction.

Ho_3. Persons exposed to animated graphics (used with static visual images and text) in microcomputer-based instruction will not score significantly higher than persons receiving microcomputer-based instruction using static visual images and text alone on free-recall tests of dynamic processes and related complex concepts when the performance measures are taken immediately following presentation of instruction.

Ho_4. Persons exposed to animated graphics (used with static visual images and text) in microcomputer-based instruction will not score significantly higher than persons receiving microcomputer-based instruction using static visual images and text alone on free-recall tests of dynamic processes and related complex concepts when the performance measures are taken following a one-week delay after presentation of instruction.

Design

To investigate these hypotheses, 72 introductory psychology, undergraduate students at The Ohio State University participated in a 3 X 2 X 5 X 2 repeated measures, factorial design study in the Autumn of 1989 and Winter of 1990. The independent variables included the three levels of instructional/presentation method employed and two visual orientations of the subsequent criterion measures. The dependent variables included the five criterion measures. In order to investigate retention of learning, these tests were administered twice, immediately after treatment exposure and following a one-week delay. Figure 1 shows the variables represented in the study. Subjects were randomly assigned to one of three treatment groups to complete a microcomputer-based tutorial presentation of information about the structure and function of the human heart. Random assignment was made again for the purpose of grouping the subjects of each treatment group for one of the two parallel forms of testing. The five performance measures were administered at that time and again following the one-week delay. Experimental arrangement is diagrammed in Figure 2.

Treatments

In each of the three treatment groups, subjects were presented information about the human heart via a combination of text and graphic images. Content and sequence for this presentation were based on materials developed by F. Dwyer (1972, 1978) for a line of studies on visual learning. Each subject viewed 54 frames (screens) of information about location and function of parts of the human heart as well as overall heart function and cycling. The text for each of the 54 frames consisted of one to four sentences (approximately ten to sixty words). A sample information screen is shown in Figure 3. The graphic images consisted of a combination of static, two-dimensional line drawings of the heart, text labels, and arrows. In each frame, the graphic depicted a lateral, posterior section of the human heart. The detail of the graphic was consistent with the form of visual generally found most effective by Dwyer [1978]. Labels consisted of a one- or two-word identifier while arrows were used to indicate a part, process, or flow.

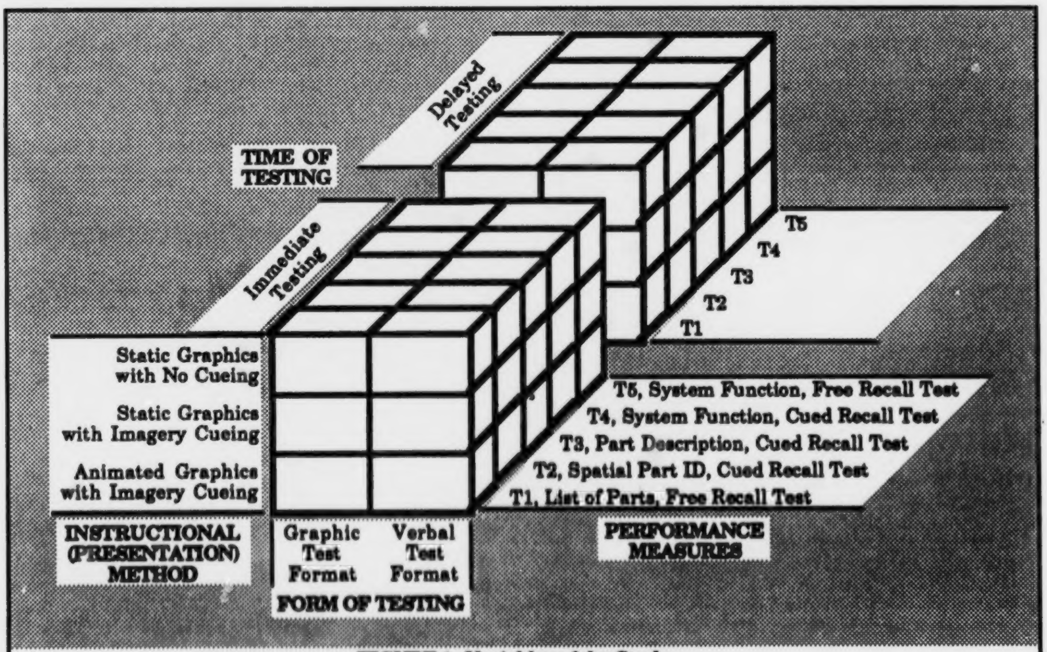

Delayed Testing
TIME OF TESTING
Immediate Testing
T5
T4
T3
T2
T1
Static Graphics with No Cueing
Static Graphics with Imagery Cueing
Animated Graphics with Imagery Cueing
T5, System Function, Free Recall Test
T4, System Function, Cued Recall Test
T3, Part Description, Cued Recall Test
T2, Spatial Part ID, Cued Recall Test
T1, List of Parts, Free Recall Test
INSTRUCTIONAL (PRESENTATION) METHOD
Graphic Test Format
Verbal Test Format
FORM OF TESTING
PERFORMANCE MEASURES

FIGURE 1. Variables of the Study.

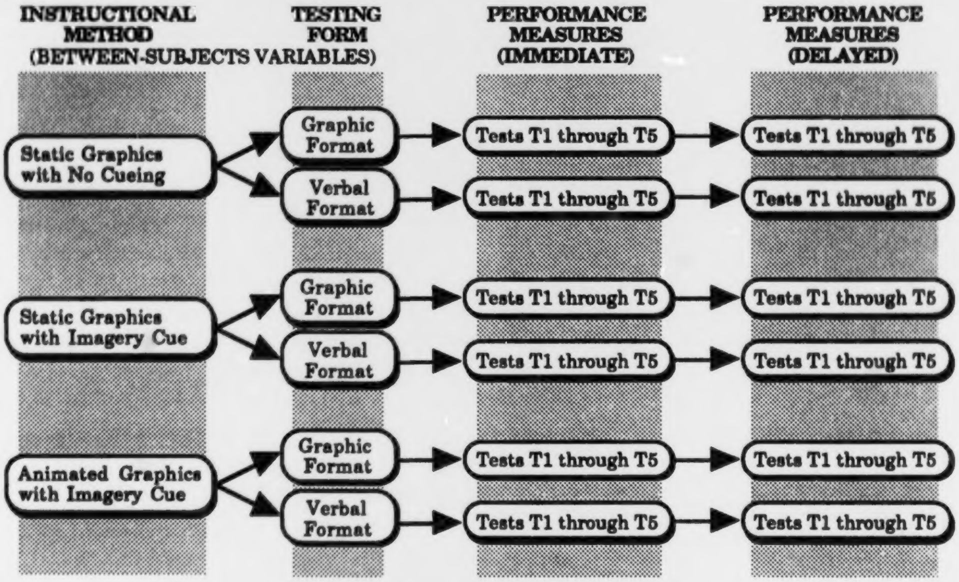
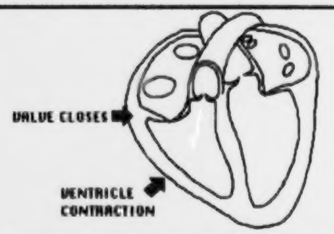

INSTRUCTIONAL METHOD
TESTING FORM
(BETWEEN-SUBJECTS VARIABLES)
PERFORMANCE MEASURES (IMMEDIATE)
PERFORMANCE MEASURES (DELAYED)
Static Graphics with No Cueing
Static Graphics with Imagery Cue
Animated Graphics with Imagery Cue
Graphic Format
Verbal Format
Tests T1 through T5

FIGURE 2. Experimental Arrangement.

The information frames were interspersed with 57 questions concerning the content. Computerized assessment of each response provided immediate feedback to the subject in the form of a simple message acknowledging response accuracy. When a response was incorrect, the subject received the option to repeat the specific information frames that related to that question and a second opportunity to correctly answer the question.

Treatment One: Static Visuals, No Cueing Strategy. The first treatment group received this microcomputer-based tutorial on the human heart, employing text and static visuals interspersed with computer-assessed, short-answer questions as described above.

Treatment Two: Static Visuals, Imagery Cueing Strategy. The second treatment included the same presentation features as the first with the addition of an external learning strategy developed by Taylor, Belland, Canelos, Dwyer, and Baker [1987]. This imagery cueing strategy involves the periodic inclusion (every five frames of presentation) of a special frame which shows an outline of the human heart and requests that the viewer fill in parts and operation of the heart mentally. It was


VALVE CLOSES
VENTRICLE CONTRACTION

The first effect of the pressure produced in the right ventricle is to force the blood behind the flaps of the tricuspid valve, closing the passage-way between the right auricle and right ventricle.

FIGURE 3. Sample information screen from the MCBI.

anticipated that this would encourage viewers to mentally visualize the information presented, thus emphasizing the processing of visual information and enhancing the learning of the content. The second treatment, therefore, is identical to the first (static graphics and text) with the addition of the imagery cueing, learning strategy.

Treatment Three: Animated Visuals, Imagery Cueing Strategy. The third treatment preserved the content, sequence, and operation of the second with one exception. Whereas the second treatment employed static visuals, the third treatment also included animated sequences of a pumping heart, where appropriate. The animated visuals were appropriately incorporated in the 54 frames of information described above to depict changes in shape, flow of blood, and movement of parts within the heart. The animation consisted of the cycling of an entire set of 16 images the human heart or an appropriate subset of the 16 images.

Rendered detail of the graphics for both treatments was identical (i.e., two-dimensional, non-shaded, line drawings of the heart in cross-section). But, in those instances when the text described a process over time, the visual became animated to depict the information over the added dimension.

Criterion Measures

Following exposure to the treatments, each subject was randomly assigned to one of two testing groups for completion of a set of five tests measuring performance on a variety of learning tasks. One testing group completed the five tests written in a format dominant in a verbal orientation, while the other group completed a parallel set of tests which emphasized stronger reliance on the graphic elements This graphic form of test was developed and validated by C. Dwyer (1984). The five tests measured (a) list learning tasks of cardiac part names (in a free recall format); (b) spatial, cued-recall tasks of part identifications; (c) simple concept learning tasks (description of parts, cued-recall); (d) complex concept learning tasks (cued recall of system operations); and (e) free-recall, problem solving tasks (integration of part morphology, part physiology, and system operation). Each of the tests was scored on a twenty point scale.

Test One (T1): Free Recall of Cardiac Part Names. The list learning task of Test T1 required the learner to list the names of the parts of the heart and its phases as recalled from the tutorial. Both the verbal and graphic forms of test groups completed the same version of this test.

Test Two (T2): Cued Recall of Cardiac Part Identification. Test T2 was a cued-recall measure of the identification of part locations in the heart. Twenty multiple choice items tested the proper identification of a part name in a line drawing of a cross section of the human heart (comparable to ones used in the microcomputer-based instruction). For the verbal form of the test, subjects were asked to identify the correct name (from a list of five) corresponding to a numbered arrow indicating a specific location in the drawing. In the graphic form of the test, subjects were asked to identify which of five labeled arrows designated a specified part name.

Test Three (T3): Cued Recall of Cardiac Part Description. Test T3 represented a simple concept learning task in which learners were required to identify a part by name after being given a description of its structure or function. In the verbal form, this involved selecting the correct name from a list of five to complete a simple statement describing the structure or function of an individual part. The graphic form, called for the selection of a labeled arrow to match the statement about a part.

Test Four (T4): Cued Recall of Cardiac System Functions. Test T4, the cued-recall of system functions, demanded that the learner make responses about relationships among parts of the heart and the cycling of the heart beat. Twenty multiple-choice items involved the complex concept learning task of identifying the appropriate part name(s) or term(s) which best completed a statement about the functions within the human heart. The graphic form of the test accomplished this by asking the learner to choose (from among four drawings of the heart) the one which best depicted the situation described in the item.

Test Five (T5): Free Recall of Cardiac System Functions. The free recall test of system functions (T5) involved the writing or drawing of cardiac system spatial arrangements and functions. The verbal form required that the learner write an essay describing the structure and function of the human heart as recalled from the computer tutorial. This was to include names and location of parts as well as a description of the pumping of blood and related phases. The graphic form required the same information, only drawn in picture form by the learner. Labels and arrows showing parts and blood flow were encouraged.

For the delayed testing session, identical forms of tests T1 through T5 were administered.

Test score results were analyzed through analysis of variance with repeated measures on a university mainframe computer using the SAS© statistical package. For post hoc analysis of multiple comparisons, the Student-Newman-Keuls Test was employed.

Results

The descriptive statistics for performances measured by the five criterion measures are shown in Tables 1 and 2 (immediate and delayed testing sessions, respectively). Graphical representations of these data are depicted in Figures 4 through 9.

From the ANOVAs conducted on the data, the following measurements of significance were made:

1. The animated visual treatment produced higher scores than the static visual treatment with no imagery cueing ($p<.05$, $F=3.37$, $df=2$) on the cued-recall test of system functions when administered immediately after treatment. (See Tables 3 and 4.)

TABLE 1
Descriptive Statistics for Immediate Testing Results

	Learning Tasks									
	T1		T2		T3		T4		T5	
	List of Parts		Part Ident.		Part Descript.		System Fns		System Fns	
	Free Recall		Cued Recall		Cued Recall		Cued Recall		Free Recall	
Treatment Groups	M	SD	M	SD	M	SD	M	SD	M	SD
Static Visual, No Cueing										
Graphic Form of Test	11.83	4.43	13.42	3.29	12.75	3.17	11.42	4.06	6.83	2.35
Verbal Form of Test	13.42	3.37	11.67	4.68	10.00	3.98	9.42	2.78	8.00	2.73
Both Forms	12.63	3.93	12.54	4.05	11.38	3.79	10.42	3.55	7.42	2.56
Static Visual, Imagery Cue										
Graphic Form of Test	13.75	4.00	12.67	3.87	10.92	5.45	12.75	4.03	8.04	4.61
Verbal Form of Test	14.33	3.23	12.17	4.47	11.92	4.03	12.25	2.83	10.33	3.93
Both Forms	14.04	3.57	12.42	4.10	11.42	4.72	12.50	3.41	9.19	4.35
Animated Visual, Imagery Cue										
Graphic Form of Test	15.50	4.01	14.83	2.96	12.83	4.61	12.50	4.10	10.50	3.04
Verbal Form of Test	14.92	3.40	14.67	3.75	13.92	3.53	13.33	3.39	13.88	4.46
Both Forms	15.21	3.65	14.75	3.31	13.38	4.05	12.92	3.71	12.19	4.11
All Treatments	13.96	3.82	13.24	3.93	12.06	4.25	11.94	3.68	9.60	4.20

Note: Maximum score = 20. n = 72.

TABLE 2
Descriptive Statistics for Delayed Testing Results

	Learning Tasks									
	T1		T2		T3		T4		T5	
	List of Parts		Part Ident.		Part Descript.		System Fns		System Fns	
	Free Recall		Cued Recall		Cued Recall		Cued Recall		Free Recall	
Treatment Groups	M	SD	M	SD	M	SD	M	SD	M	SD
Static Visual, No Cueing										
Graphic Form of Test	8.33	4.48	12.17	4.43	12.08	3.70	10.42	3.96	8.71	3.07
Verbal Form of Test	11.42	4.52	9.67	5.07	7.67	3.98	8.42	3.45	5.58	2.53
Both Forms	9.88	4.67	10.92	4.83	9.88	4.39	9.42	3.78	7.15	3.18
Static Visual, Imagery Cue										
Graphic Form of Test	10.00	6.45	11.58	4.50	11.17	4.73	10.75	4.86	7.21	5.01
Verbal Form of Test	14.00	5.08	10.92	4.72	10.75	4.58	11.08	3.45	8.33	4.47
Both Forms	12.00	6.04	11.25	4.52	10.96	4.55	10.92	4.13	7.77	4.68
Animated Visual, Imagery Cue										
Graphic Form of Test	13.00	5.48	14.08	2.84	12.92	3.65	12.25	3.44	8.83	2.85
Verbal Form of Test	12.17	4.73	12.83	3.79	11.75	4.11	12.83	2.98	11.54	5.07
Both Forms	12.58	5.02	13.46	3.34	12.33	3.85	12.54	3.16	10.19	4.25
All Treatments	11.49	5.33	11.88	4.37	11.06	4.33	10.96	3.88	8.37	4.24

Note: Maximum score = 20. n = 72.

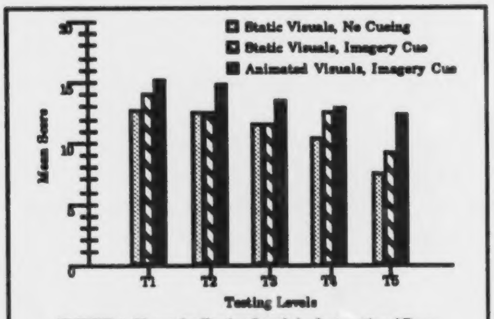


FIGURE 4. Means for Testing Levels by Instructional Type (Immediate Testing)

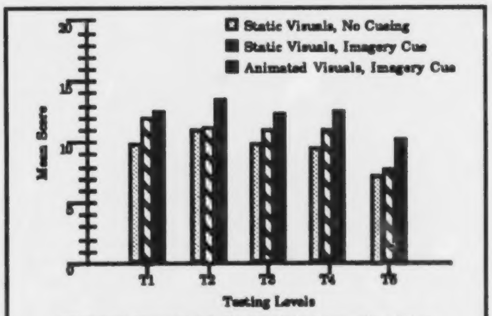


FIGURE 5. Means for Testing Levels by Instructional Type (Delayed Testing)

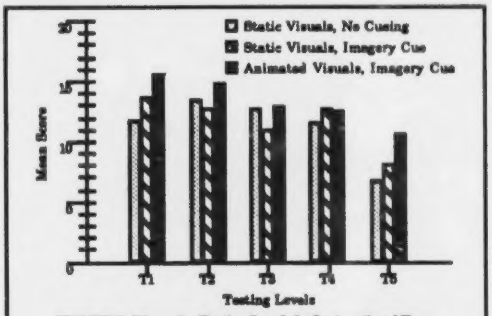


FIGURE 6. Means for Testing Levels by Instructional Type (Immediate Testing, Graphic Form of Test)

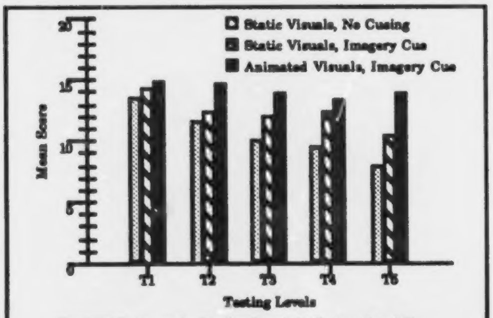


FIGURE 7. Means for Testing Levels by Instructional Type (Immediate Testing, Verbal Form of Test)

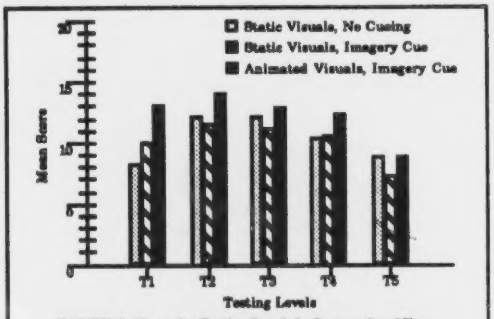


FIGURE 8. Means for Testing Levels by Instructional Type (Delayed Testing, Graphic Form of Test)

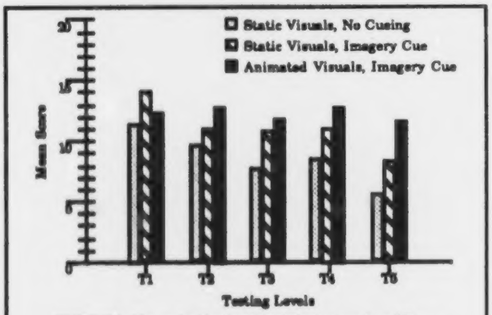


FIGURE 9. Means for Testing Levels by Instructional Type (Delayed Testing, Verbal Form of Test)

2. The static visual treatment with imagery cueing produced higher scores than the static visual treatment with no imagery cueing ($p<.05$, $F=3.37$, $df=2$) on the cued-recall test of system functions when administered immediately after treatment. (See Tables 3 and 4.)

3. The animated visual treatment produced higher scores than the static visual treatment with no imagery cueing ($p<.05$, $F=4.09$, $df=2$) on the cued-recall test of system functions when administered one week after treatment. (See Tables 3 and 5.)

4. The animated visual treatment yielded higher scores than each of the static visual

treatments with and without imagery cueing (p<.001, F=10.64, df=2) on the free-recall test of system functions when administered immediately after treatment. (See Tables 6 and 7.)

5. The static visual treatment with imagery cueing yielded higher scores than the static visual treatment without imagery cueing (p<.001, F=10.64, df=2) on the free-recall test of system functions when administered immediately after treatment. (See Tables 6 and 7.)

6. Due to an interaction between instructional method and form of test (p<.05) for the delayed testing of the free-recall test of system functions, follow-up analyses were made by individual form of test. (See Table 8.)

7. For the verbal form of the free-recall test of system functions, the animated visual treatment yielded higher scores than the static visual treatment with no imagery cueing (p<.01, F=6.15, df=2) when the test was administered one week after treatment. (See Table 9.)

Table 10 summarizes these results.

Discussion

In this study, the primary focus was on learning higher order concepts (namely dynamic processes involving changes in multiple variables over time) aided by the animation of graphic, instructional elements. Dynamic process was exemplified in the content (delivered by the instructional treatments) as (a) the simultaneous functioning of several parts of the human heart, (b) relationships among parts, and (c) the resulting overall function of the cardiac system through the consequent heart beat cycle.

To indicate the learning effects of animated visuals in the presentation, significant measures in the fourth and fifth tests (cued- and free-recall of cardiac system functions) were sought.

As expected, those tests which did not demonstrate learning of dynamic processes (tests T1 through T3 – list learning of part name, part location identification, and part description) did not show any significant differences among the treatment groups for variations in the instructional method (i.e., visual form or cueing strategy). However, where it was anticipated that the inclusion of animated information would be most effective (tests T4 and T5 – tests of cardiac system functions), significant differences were measured.

On both tests of system operations (cued and free recall), when tested immediately after treatment exposure, learners who experienced the microcomputer-based instruction with animated graphics outperformed those seeing only the static form and no imagery cue strategy.

In fact, both groups who experienced the imagery cue (animated and static graphics) significantly outperformed those who viewed the static visuals, no cue treatment

TABLE 3.
Analysis of Variance of
Performance on the Cued Recall of System Functions
by Instructional Methods, Form of Test, and Time of Test

Source	df	SS	MS	F
Between Ss	71	1798.1597		
Instructional Method (A)	2	194.5972	97.2986	4.14*
Test Form (B)	1	7.5625	7.5625	0.32
Method X Form (AB)	2	46.5417	23.2708	0.99
Error Between (S/AB)	66	1549.4583	23.4766	
Within Ss	72	263.5000		
Time of Test (C)	1	35.0069	35.0069	10.62**
Method X Time (AC)	2	8.7639	4.3819	1.33
Form X Time (BC)	1	0.3403	0.3403	0.10
Method X Form X Time (ABC)	2	1.9306	0.9653	0.29
Error Within (SC/AB)	66	217.4583	3.2948	
Total	143	2061.6597		

* p < .05
** p < .01
*** p < .001

TABLE 4.
Analysis of Variance of
Performance on the Cued Recall of System Functions
by Instructional Methods and Form of Test (Immediate Testing)

Source	df	SS	MS	F
Instructional Method (A)	2	86.1111	43.0556	3.37*
Test Form (B)	1	5.5556	5.5556	0.43
Method X Form (AB)	2	24.1111	12.0556	0.94
Error (S/AB)	66	844.0000	12.7879	
Total	71	959.7778		

* p < .05
** p < .01
*** p < .001

TABLE 5.
Analysis of Variance of
Performance on the Cued Recall of System Functions
by Instructional Methods and Form of Test (Delayed Testing)

Source	df	SS	MS	F
Instructional Method (A)	2	117.2500	58.6250	4.19*
Test Form (B)	1	2.3472	2.3472	0.17
Method X Form (AB)	2	24.3611	12.1806	0.87
Error (S/AB)	66	922.9167	13.9836	
Total	71	1066.8750		

* p < .05
** p < .01
*** p < .001

TABLE 6.
Analysis of Variance of
Performance on the Free Recall of System Functions
by Instructional Methods, Form of Test, and Time of Test

Source	df	SS	MS	F
Between Ss	71	2285.0815		
Instructional Method (A)	2	384.4618	192.2309	7.28**
Test Form (B)	1	56.5767	56.5767	2.15
Method X Form (AB)	2	100.6701	50.3351	1.91
Error Between (S/AB)	66	1743.0729	26.4102	
Within Ss	72	297.6250		
Time of Test (C)	1	54.2906	54.2906	21.85***
Method X Time (AC)	2	18.5729	9.2865	3.74*
Form X Time (BC)	1	37.5156	37.5156	15.10***
Method X Form X Time (ABC)	2	23.1563	11.5781	4.66*
Error Within (SC/AB)	66	163.9896		
Total	143	2582.7065		

* p < .05
** p < .01
*** p < .001

TABLE 7.
Analysis of Variance of
Performance on the Free Recall of System Functions
by Instructional Methods and Form of Test (Immediate Testing)

Source	df	SS	MS	F
Instructional Method (A)	2	279.1736	139.5868	10.64***
Test Form (B)	1	93.3889	93.3889	7.12**
Method X Form (AB)	2	14.6319	7.3160	0.56
Error (S/AB)	66	866.1250	13.1231	
Total	71	1253.3194		

* p < .05
** p < .01
*** p < .001

TABLE 8.
Analysis of Variance of
Performance on the Free Recall of System Functions
by Instructional Methods and Form of Test (Delayed Testing)

Source	df	SS	MS	F
Instructional Method (A)	2	123.8611	61.9306	3.93*
Test Form (B)	1	1.0035	1.0035	0.06
Method X Form (AB)	2	109.1944	54.5972	3.46*
Error (S/AB)	66	1040.9375	15.7718	
Total	71	1274.9965		

* p < .05
** p < .01
*** p < .001

TABLE 9.
Analysis of Variance of
Performance on the Delayed Testing of Free Recall of System Functions
by Instructional Methods for Graphic and Verbal Forms of Test

Source	df	SS	MS	F
Graphic Form of Test	35	488.2500		
Instructional Method (A)	2	19.6250	9.8125	0.69
Error (S/A)	33	468.6250	14.2008	
Verbal Form of Test	35	785.7431		
Instructional Method (A)	2	213.4306	106.7153	6.15**
Error (S/A)	33	572.3125	17.3428	

* $p < .05$
** $p < .01$
*** $p < .001$

form in the immediate testing session. This leaves some uncertainty as to whether the measured differences should be attributed to the inclusion of the animation or the presence of the embedded cueing strategy.

Two patterns of results, however, may suggest a clearer contribution by the form of visuals.

It was observed that the animated-visual group maintained superiority of performance over the static-visual, no-cue group following the one week delay, while the static-visual, imagery-cue group could not. This pattern of retention was consistent in both formats (graphic and verbal) of the cued-recall test as well as in the verbal format of the free-recall test. This more strongly suggests the role of the animated visual in learning dynamic processes. It appears that subjects in the group experiencing the animated visual treatment were able to better retain information about how the cardiac system operates. Those viewing only static visuals could not be differentiated by the imagery cueing technique following the delay between instruction and testing.

TABLE 10.
Summary of Analyses of Variance of
Performance on the Recall of Cardiac System Functions

	Instructional Methods		
Performance Measures	Static Visuals, No Cueing (SVNC) superior to:	Static Visuals, Imagery Cue (SVIC) superior to:	Animated Visuals, Imagery Cue (AVIC) superior to:
Cued Recall of System Functions			
Immediate Testing (H01)	----	SVNC*	SVNC*
Delayed Testing (H02)	----	----	SVNC*
Free Recall of System Functions			
Immediate Testing (H03)	----	SVNC***	SVIC, SVNC***
Delayed Testing (H04)			
Graphic Form of Test	----	----	----
Verbal Form of Test	----	----	SVNC**

* $p < .05$
** $p < .01$
*** $p < .001$

The most pronounced contrast in this study occurred with the immediate testing of the free recall of system functions. On this level, the performances of learners who viewed the animated presentation were significantly higher than those of learners who saw the static form, both with and without the imagery cue. In this case, learners appear to have been helped by seeing the heart animated for the free-recall task, when performed immediately following instruction.

Conclusion

This study shows that the use of animation in microcomputer-based instruction to teach a dynamic process can be beneficial. While the present study did not clearly distinguish the impact made by the animation of visuals from that made by the presence of an external, mental imaging strategy in all aspects, certain results were clearly supportive of the contribution to learning made by animating the visuals. Maintained significance in the retention measures and association of significance to the specific learning tasks associated with dynamic processes presented from the content, suggest potential areas of focus for further study.

This study, like others recently reported by Rieber (1988) and Baek and Layne (1988) links the use of animation in microcomputer-based instruction to specific learning outcomes. Such linkage of the use of a visual form to a particular instructional purpose implies the complex relationship between forms of visual information and instructional function.

From an instructional design perspective, it appears that the inclusion of animation adds another facet to the visual qualities of instructional systems. As the increased availability of hardware and software systems make the design and use of this visual form accessible, further evidence of the impact of animated visual information should be explored.

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Effects of MCBI-Embedded, Visual Cognitive Strategies on Learning as Measured by Iconic and Text-Based Testing

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William D. Taylor
Francis M. Dwyer

Since 1967, Dwyer has been publishing results of his research on learning from iconic representations (visual learning). Using materials which taught about the parts and functions of the human heart, he, his students and other researchers have investigated many properties of visuals themselves as well as a wide array of instructional variables which were presumed to improve learning from the visuals. Most of these studies are reported in Dwyer's three books on the subject (1972, 1978, 1987). The present study is in this research tradition. It is in the line of studies conducted at The Ohio State University in collaboration with James Canelos* and Dwyer, himself, at The Pennsylvania State University. In this collaboration, the work conducted since 1982 has involved the use of microcomputers to deliver the instructional treatment. The results of these studies have demonstrated: that imposing pacing improved learning and decreased the time needed to achieve those improved results (1985), that learning of the pictorial information could be improved by attention directing and mental imaging strategies which were embedded in the computer tutorial programming (1987, 1988), and that providing review to learners who had produced incorrect responses should be required of learners who made many mistakes and should perhaps be skipped for those learners who made few errors (1985). The present study continues the work related to embedded cognitive strategies, but involved implementing the courseware on Macintosh II® computers. This transformation preserved the structure of the previous programmed and computer-based versions, but improved the graphics so that they were much more closely comparable to those in the programmed booklet, and increased the speed so that the learner experienced no waiting for the computer to present the information.

The problem of the present study grew out of initial observations that the performance of subjects was substantially lower on those portions of the tests which required understanding and remembering of the content of the visuals. Thus the researchers wondered if it would be possible to embed cognitive strategies into the instructional sequence which would improve the test results. Two embedded strategies were conceived and implemented. The first simply caused the learner to look at the visual for a period of time before the text was presented. The assumption was made that if the visual appeared on the screen, the learner would look at it and learn from it. Later, she/he could attend to the text. The second strategy interposed a screen which asked the learners to form a mental image of the visual material which they had learned up to that point in the sequence. This stimulus was repeated at regular intervals throughout the instructional sequence. In this case, it was presumed that the mental activity and effort needed to form a mental image would improve the learning. In an earlier study (Canelos et. al., 1989), the researchers had demonstrated the efficacy of either treatment condition for improving performance measured immediately after the instruction. Interestingly, the results of that study showed that the two strategies when used together did not have a cumulative effect. In order to move the platform for these experiments to more modern technology (the earlier experiments were performed with Apple II® equipment) and be able to compare the results, several features of the earlier experiment were repeated. However, in this experiment, the effects of these embedded cognitive strategies on delayed tests (retention) and the effects of testing in iconic vs. text-based stimuli forms were also measured.

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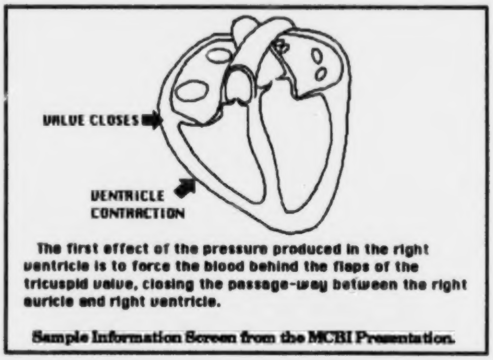
* Jim Canelos participated in the design of this study but his untimely death prevented his usual intense colleagueship. We dedicate this report to his memory.

Treatments

The treatments for this study consisted of three identical sequences of pictures and text which had been developed in linear programmed booklet form by Dwyer. The pictures of the heart were in the form of two-dimensional line drawings which had been determined by Dwyer to yield the most learning (1972, 1978). The pictures and text in the programmed booklet were arranged in such a way that they could be placed on a computer screen essentially identical to the layout in the booklet. (See Sample Information Screen.) In this way, results could be compared to those which resulted from studies using the booklet. After the learner viewed the picture and read the text for a period of time allowing for a normal adult reading rate of 300 wpm and an additional 10% of this time for cognitive processing, this information was removed from the screen and a question appeared. The learner then supplied a "fill-in-the-blank" answer to the question. If she/he answered correctly, subsequent frames of information were presented. If she/he answered in-



The first effect of the pressure produced in the right ventricle is to force the blood behind the flaps of the tricuspid valve, closing the passage-way between the right auricle and right ventricle.

Sample Information Screen from the MCBI Presentation.

correctly, a review of the previous screen(s) was offered.

Treatment one, No Cue. This treatment is exactly as described above.

Treatment two, Imagery Cue. This treatment was the same as treatment one except that after approximately every five information screens a screen appeared with an outline of the outer shape of the human heart and the instructions, "Use this outline to picture the parts and labels of the heart you have seen today". This screen appeared for five seconds and then instruction resumed.

Treatment three, Attention Direction. This treatment was the same as treatment one except that the pictures appeared on the computer screen for five seconds before any text appeared so that the learner's attention would be directed to the picture.

Criterion Measures

Two sets of 5 tests were used to measure the results of this experiment. These tests were developed and standardized in the text form by Frank Dwyer and in the iconic form by Carol Dwyer. These tests measure five types of learned outcomes.

List learning. This task is a simple recall task in which on both the text-based and iconic form, the student is asked to list all the names she/he can recall of parts of the heart.

Spatial learning, Cued recall. This test is a multiple-choice test in which on the text-based version, a drawing of the heart is provided with an arrow pointing to a particular part and the student is asked to select the correct term out of a choice of five. On the icon-based test, the learner is provided a name and she/he is asked to select from among a set of five pictures the one which identifies the named part.

Simple concept learning. In the text-based form of this test, learners responded to multiple-choice items which measured knowledge of the description of a critical part or function of the heart. In the iconic form, learners select an appropriate label from a diagram of the heart for a specified part description or function.

Complex concept learning. In the text-based form of this text, learners responded to multiple-choice items which involved knowledge of "if-then" relationships in heart functions. In the iconic form, learners selected the one diagram from five which properly represented a specified cardiac system function, state, or relationship.

Spatial learning, free recall. In the text-based form, learners wrote an essay describing the structure and functions of the heart using the terminology they had learned. In the iconic version, learners drew a heart on a blank page including the structures, naming the parts, and describing the way the heart functions with labels and arrows.

Population & Sample

The population for this study consists of freshmen and sophomores at large public American universities as manifest in those students enrolling in Psychology 100 courses. The sample of 72 was randomly assigned to the treatments from Psychology 100 students enrolled at The Ohio State University during the Autumn Quarter, 1989. The department of Psychology at OSU monitors the demographics of these students and assures experimenters that the subject pool in Psychology 100 is representative of lower-division college undergraduates.

Design

This study utilized a 3 X 5 X 2 X 2 repeated measures, factorial design. There were three independent variables represented by the three treatments. There were five dependent variables represented by the scores on the five criterion measures. These tests were administered in two parallel forms—text based and icon based—at two different times after the treatment—immediate and after a one-week interval. Interestingly, while there is usually considerable difficulty measuring experimental subjects on retention tests, in this experiment there were only two subjects who did not complete the second testing session. Thus a complete and balanced design was executed.

Results

The descriptive statistics for the immediate testing are reported in Table 1 and those for the delayed testing (retention tests) are displayed in Table 2. In order to make inferences about these data, ANOVAs yielded the following estimates of significance:

1. The text-based form of the list learning, free-recall test yielded higher scores ($p<.05$, $F=6.74$, $df=1$) than the iconic form when administered one week after treatment. (See Tables 3 and 4.)

2. The image cue treatment produced higher scores ($p<.05$, $F=3.36$, $df=2$) on the text-based form of the cued-recall, complex concept test than did the no-cue treatment when the test was administered immediately after treatment. (See Tables 5 and 6.)

3. The attention directing treatment produced higher scores ($p<.05$, $F=3.07$, $df=2$) on the spatial free-recall test when administered immediately after treatment than did the no-cue treatment. (See Tables 7 and 8.)

4. The text-based form of the spatial free-recall test yielded higher scores ($p<.05$, $F=6.74$, $df=1$) than the iconic form when administered one week after treatment. (See Tables 7 and 8.)

5. The attention directing treatment yielded higher scores than the no-cue treatment on the text-based form of the spatial free-recall test both when administered immediately after the treatment ($p<.05$, $F=3.70$, $df=2$) and when administered one week after treatment ($p<.05$, $F=3.83$, $df=2$). (See Tables 7, 9, 10, and 11).

TABLE 1
Descriptive Statistics for Immediate Testing Results

	Learning Tasks									
	List Learning, Free Recall		Spatial Learning, Cued Recall		Simple Concept, Cued Recall		Complex Concept, Cued Recall		Spatial Learning, Free Recall	
Treatment Groups	M	SD	M	SD	M	SD	M	SD	M	SD
No Cueing Strategy										
Iconic Form of Test	11.83	4.43	13.42	3.29	12.75	3.17	11.42	4.06	6.83	2.35
Text-Based Form of Test	13.42	3.37	11.67	4.68	10.00	3.98	9.42	2.78	8.00	2.73
Both Forms	12.63	3.93	12.54	4.05	11.38	3.79	10.42	3.55	7.42	2.56
Imagery Cueing Strategy										
Iconic Form of Test	13.75	4.00	12.67	3.87	10.92	5.45	12.75	4.03	8.04	4.61
Text-Based Form of Test	14.33	3.23	12.17	4.47	11.92	4.03	12.25	2.83	10.33	3.93
Both Forms	14.04	3.57	12.42	4.10	11.42	4.72	12.50	3.41	9.19	4.35
Attention Directing Strategy										
Iconic Form of Test	14.58	2.94	12.42	3.42	11.00	3.62	10.58	3.20	7.83	3.39
Text-Based Form of Test	14.67	3.42	14.00	3.02	13.25	3.33	10.83	2.41	12.00	4.05
Both Forms	14.63	3.12	13.21	3.26	12.13	3.59	10.71	2.77	9.92	4.22
All Treatments	13.39	3.91	12.83	3.46	11.56	4.16	11.58	3.78	7.57	3.51

Note: Maximum score = 20. n = 72.

TABLE 2
Descriptive Statistics for Delayed Testing Results

	Learning Tasks									
	List Learning, Free Recall		Spatial Learning, Cued Recall		Simple Concept, Cued Recall		Complex Concepts, Cued Recall		Spatial Learning, Free Recall	
Treatment Groups	M	SD	M	SD	M	SD	M	SD	M	SD
No Cueing Strategy										
Iconic Form of Test	8.33	4.48	12.17	4.43	12.08	3.70	10.42	3.96	8.71	3.07
Text-Based Form of Test	11.42	4.52	9.67	5.07	7.67	3.98	8.42	3.45	5.58	2.53
Both Forms	9.88	4.67	10.92	4.83	9.88	4.39	9.42	3.78	7.15	3.18
Imagery Cueing Strategy										
Iconic Form of Test	10.00	6.45	11.58	4.50	11.17	4.73	10.75	4.86	7.21	5.01
Text-Based Form of Test	14.00	5.08	10.92	4.72	10.75	4.58	11.08	3.45	8.33	4.47
Both Forms	12.00	6.04	11.25	4.52	10.96	4.55	10.92	4.13	7.77	4.68
Attention Directing Strategy										
Iconic Form of Test	11.00	4.77	10.75	3.41	10.50	3.99	10.33	3.82	7.21	2.86
Text-Based Form of Test	13.25	4.94	13.42	3.45	11.25	4.11	10.33	2.35	9.63	3.70
Both Forms	12.13	4.88	12.08	3.62	10.88	3.98	10.33	3.10	8.42	3.46
All Treatments	11.33	5.26	11.42	4.32	10.57	4.28	10.22	3.69	7.78	3.81

Note: Maximum score = 20. n = 72.

TABLE 3
Analysis of Variance of
Performance on the Free Recall, List Learning Task
by Instructional Methods, Form of Test, and Time of Test

Source	df	SS	MS	F
Between Ss	71	2456.1598		
Instructional Method (A)	2	124.4306	62.2153	1.88
Test Form (B)	1	134.1736	134.1736	4.05*
Method X Form (AB)	2	10.5139	5.2569	0.16
Error Between (S/AB)	66	2187.0417	33.1370	
Within Ss	72	645.5000		
Time of Test (C)	1	212.6736	212.6736	37.54***
Method X Time (AC)	2	3.0972	1.5486	0.27
Form X Time (BC)	1	50.1736	50.1736	8.86**
Method X Form X Time (ABC)	2	5.6806	2.8403	0.50
Error Within (SC/AB)	66	373.8750	5.6648	
Total	143	3101.3698		

* p < .05
** p < .01
*** p < .001

TABLE 4
Analysis of Variance of
Performance on the Free Recall, List Learning Task
by Instructional Methods and Form of Test (Delayed Testing)

Source	df	SS	MS	F
Instructional Method (A)	2	76.7500	38.3750	1.48
Test Form (B)	1	174.2222	174.2222	6.74*
Method X Form (AB)	2	9.1944	4.5972	0.18
Error (S/AB)	66	1705.8333	25.8460	
Total	71	1966.0000		

* p < .05
** p < .01
*** p < .001

TABLE 5
Analysis of Variance of
Performance on the Cued Recall, Complex Concept Learning Test
by Instructional Methods and Time of Test (Text-Based Form of Test)

Source	df	SS	MS	F
Between Ss	35	556.1111		
Instructional Method (A)	2	92.1111	46.0556	3.28*
Error Between (S/A)	33	464.0000	14.0607	
Within Ss	36	110.9997		
Time of Test (C)	1	14.2222	14.2222	4.92*
Method X Time (AC)	2	1.4444	0.7222	0.25
Error Within (SC/AB)	33	95.3333	2.8889	
Total	71	667.1108		

* p < .05
** p < .01
*** p < .001

TABLE 6
Analysis of Variance of
Performance on the Cued Recall, Complex Concept Learning Task
by Instructional Methods and Time of Test (Text-Based Form of Test)

Source	df	SS	MS	F
Immediate Testing	35	285.0000		
Instructional Method (A)	2	48.1667	24.0833	3.36*
Error (S/A)	33	236.8333	7.1768	
Delayed Testing	35	367.8889		
Instructional Method (A)	2	45.38889	22.6944	2.32
Error (S/A)	33	322.5000	9.7727	

* p < .05
** p < .01
*** p < .001

TABLE 7
Analysis of Variance of
Performance on the Free Recall, Spatial Test
by Instructional Methods, Form of Test, and Time of Test

Source	df	SS	MS	F
Between Ss	71	1845.6233		
Instructional Method (A)	2	87.3993	43.6997	1.82
Test Form (B)	1	64.6684	64.6684	2.70
Method X Form (AB)	2	111.8785	55.9392	2.33
Error Between (S/AB)	66	1581.6771	23.9648	
Within Ss	72	2359.6719		
Time of Test (C)	1	40.6406	40.6406	14.83***
Method X Time (AC)	2	11.3229	5.6615	2.07
Form X Time (BC)	1	51.9601	51.9601	18.96***
Method X Form X Time (ABC)	2	16.5660	8.2830	3.02
Error Within (SC/AB)	66	180.8854	2.7407	
Total	143	4205.2952		

* p < .05
** p < .01
*** p < .001

TABLE 8
Analysis of Variance of
Performance on the Free Recall, Spatial Learning Test
by Instructional Methods and Form of Test (Immediate Testing)

Source	df	SS	MS	F
Instructional Method (A)	2	79.3402	39.6702	3.07*
Test Form (B)	1	116.2813	116.2813	9.01**
Method X Form (AB)	2	27.5625	13.7813	1.07
Error (S/AB)	66	852.2292	12.9126	
Total	71	1075.4132		

* p < .05
** p < .01
*** p < .001

TABLE 9
Analysis of Variance of
Performance on the Free Recall, Spatial Learning Test
by Instructional Methods and Form of Test (Delayed Testing)

Source	df	SS	MS	F
Instructional Method (A)	2	19.3619	9.6809	0.70
Test Form (B)	1	0.3472	0.3472	0.03
Method X Form (AB)	2	100.8819	50.4409	3.66*
Error (S/AB)	66	910.3333	13.7929	
Total	71	1030.9444		

* p < .05
** p < .01
*** p < .001

TABLE 10
Analysis of Variance of
Performance on the Free Recall, Spatial Learning Test
by Instructional Methods and Time of Test (Verbal Form of Test)

Source	df	SS	MS	F
Between Ss	35	963.0937		
Instructional Method (A)	2	198.5208	99.2604	4.28*
Error Between (SA)	33	764.5729	23.1689	
Within Ss	36	200.6250		
Time of Test (C)	1	92.2535	92.2535	28.26***
Method X Time (AC)	2	0.6319	0.3160	0.10
Error Within (SC/AB)	33	107.7396	3.2648	
Total	71	1163.7187		

* p < .05
** p < .01
*** p < .001

TABLE 11
Analysis of Variance of
Performance on the Free Recall, Spatial Learning Test
by Instructional Methods and Time of Test (Verbal Form of Test)

Source	df	SS	MS	F
Immediate Testing	35	528.5556		
Instructional Method (A)	2	96.8889	48.4444	3.70*
Error (S/A)	33	431.6667	13.0808	
Delayed Testing	35	542.9097		
Instructional Method (A)	2	102.2639	51.1319	3.83*
Error (S/A)	33	440.6458	13.3529	

* p < .05
** p < .01
*** p < .001

Figures 1-6 provide a view of the patterns of scores from the five tests, three treatments, two test forms and two testing times. One can estimate the general patterns of findings from these graphs and can see that the test scores ranged from approximately 75% of the possible points to less than 50%.

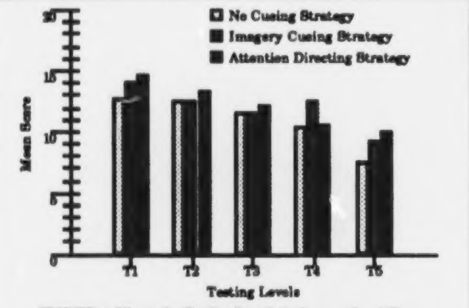


FIGURE 1. Means for Testing Levels by Instructional Type (Immediate Testing)

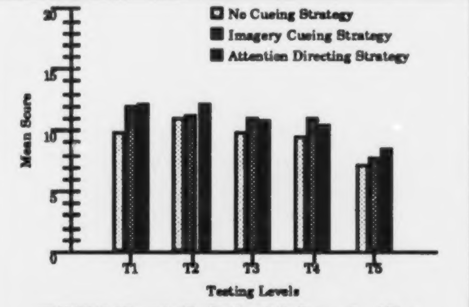


FIGURE 2. Means for Testing Levels by Instructional Type (Delayed Testing)

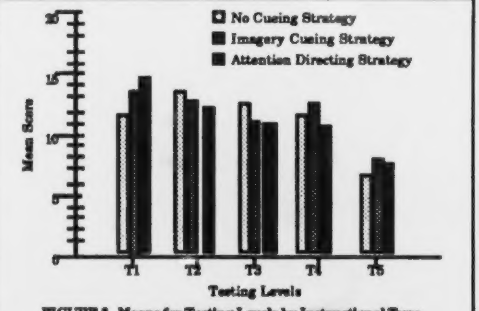


FIGURE 3. Means for Testing Levels by Instructional Type (Immediate Testing, Graphic Form of Test)

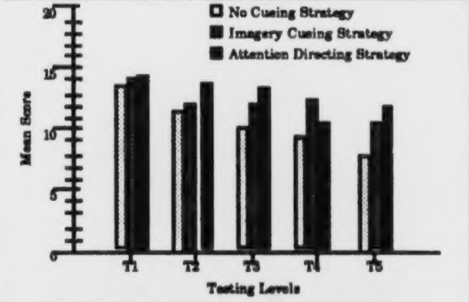


FIGURE 4. Means for Testing Levels by Instructional Type (Immediate Testing, Verbal Form of Test)

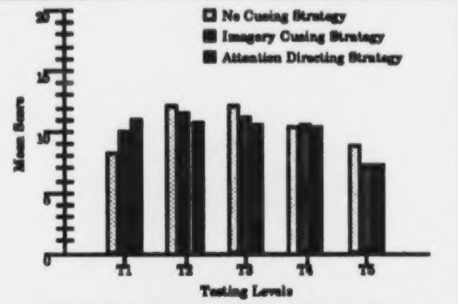


FIGURE 5. Means for Testing Levels by Instructional Type (Delayed Testing, Graphic Form of Test)

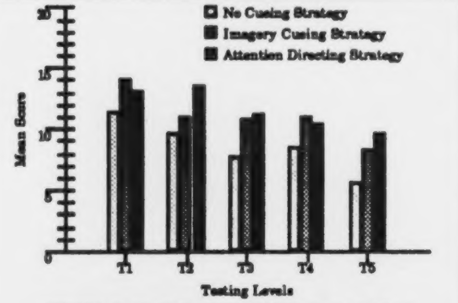


FIGURE 6. Means for Testing Levels by Instructional Type (Delayed Testing, Verbal Form of Test)

Discussion

In this study the investigators were attempting to clarify ambiguities which arose in previous work and to ascertain the relationship of test form to treatment in both immediate and delayed testing situations. Unfortunately no such clear-cut pattern emerged. For example, one would expect that performance would deteriorate when a one-week delay was inserted between the testing experiences, but one hoped that the deterioration would be less with the visual form of the test. The results of this study did not confirm such a hunch. In fact, most of the significant results ocurred with the verbal form of the tests. Belland (1969) in a study with primary and intermediate grade students had found that intermediate grade students had developed a strategy which resulted in improved performance in situations where the learning stimuli were visual and the tests were auditorially-based. He surmised that the process of school learning had yielded a cognitive strategy which learners found effective in translating varied learning experiences to the questioning they received from teachers in the early grades. In this study, the test which showed the most significant findings was the text-based one for spatial free recall. This test asked the learners to write an essay describing the parts and functions of the human heart. Perhaps, learners had experienced so many essay tests in their school careers before becoming college freshman or sophomores, they were able to respond in an efficient manner to this test stimulus.

In this study, it was also interesting to note that the attention-directing cue seemed to be more efficacious. This needs further investigation, but if replicated by other studies, it would suggest that mental imaging is not effective as a learning strategy for these students. Whether this is a characteristic of learners or simply the result of learners choosing to ignore study suggestions with which they are not familiar, or whether they have found the technique ineffective, such a finding should be of concern for researchers in visual literacy who would expect mental imaging to be a very powerful thinking and learning technique.

Conclusion

In the context of Dwyer's program of systematic evaluation, many findings have been made regarding the use of visuals in instruction. Learning about the parts and functions of the human heart has sometimes been criticized by the research community in educational technology, but this task remains a viable one for continuing investigations of visual teaching/learning phenomena. The task requires approximately one-half to three-quarters hour of instructional time and approximately one-half hour of testing time. Very few subjects know the content of this task so that control groups are only necessary every few years to reconfirm that. This makes subjects available for the various treatments.

In the microcomputer-based form, this instruction is amenable to the manipulation of a wide variety of variables which presumably would operate not only in the domain of computer-based instruction but also in instruction delivered by humans or other media systems. From this study, it would seem reasonable to recommend that directing attention to visual information will improve learning from the visuals. This effect can be measured with standard classroom techniques including the essay. Perhaps instruction which is directed specifically to improving visual literacy could change this in the future.

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Visual Literacy Training: Changing How Journalism Students Reason About Layout

Kevin G. Barnhurst
D. Charles Whitney

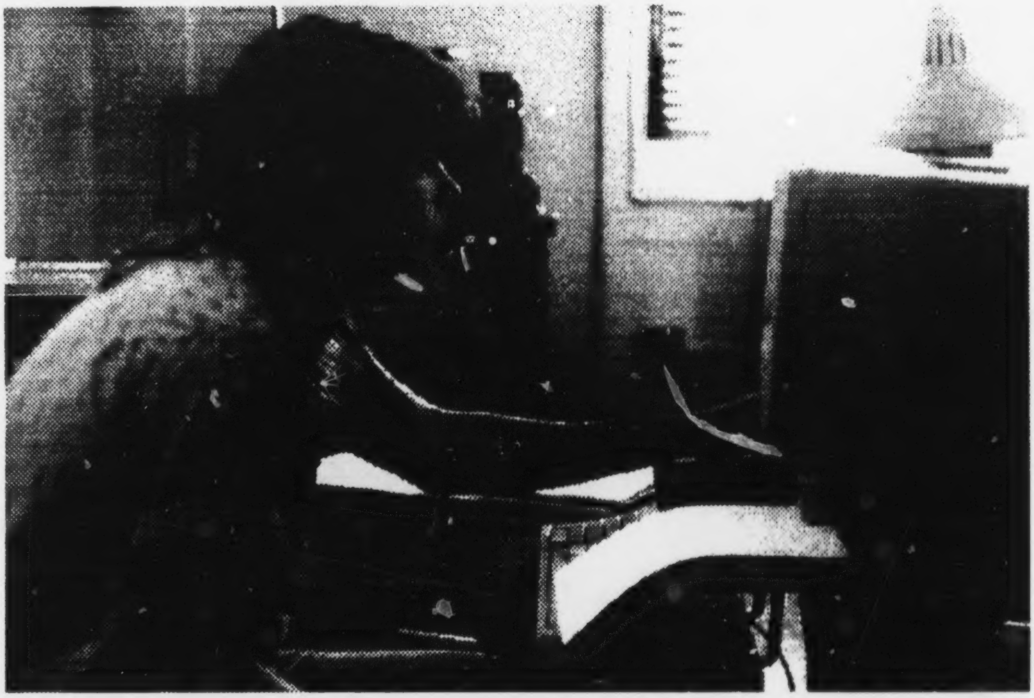
JOURNALISM EDUCATION HAS historically slighted or ignored visual literacy. Instead, students have been taught to make visual decisions by following the industry — its traditions, techniques, and tastes. This study hypothesized that by expanding their visual vocabulary, their observational skills, and their knowledge of the cultural context of journalistic images, visual literacy training would shift the students' reasoning about layout, by broadening the variety of reasons they could articulate, by adding expressive and analytic strategies to their established patterns, and by increasing the variety of solutions they reached. The results from an experimental study showed that although they gave about the same number of reasons for an equally varied number of layout solutions, their reasoning shifted dramatically. On the post-test, the great majority of students appealed less to technique, tradition, and taste; instead, they explained how their layouts expressed the mood and meaning of the stories and art content. In the broadest interpretation, visual literacy training can be seen as empowering. Instead of viewing themselves as cogs in the machine of the media industry, the students can envision their work as an expression of their own ethical judgments and cultural values.

Previous Approaches to Layout Training

In the major textbooks, journalism students have been taught three approaches to layout. They were encouraged to ask what other newspapers did, what made things fit into the page, and what looked good or "pleasing." These strategies represent three strains of thought — the *traditional*, the *technical*, and the *aesthetic*.

The most important of these three strategies was following the example of existing newspapers. In the absence of a vocabulary and analytical framework for visual thinking, these texts relied on reproductions of newspaper pages considered admirable (see Allen, 1947, for example). The vocabulary used to describe these illustrations amounted to little more than pointing and grunting approvingly. The student learned by inference that the most important reasoning about a layout was *traditional*—doing what was already being done in the industry at leading newspapers.

The descriptions of the layouts that illustrated these textbooks generally took a technical tack, identifying the typefaces and sizes, referring to the mechanical specifications and measure-ments of columns.



During a session for the visual literacy course, journalism student Jeff Ostrowski works in the Typography Laboratory at the University of Illinois College of Communications.

Arnold added to the technical vocabulary by recording the names used in the newspaper back shop for specific headline configurations, but the focus was usually on the page as a whole (Arnold, 1969, p. 106). Thus he made the traditional reasoning articulate by referring to technique.

Justifications for the *technical* or functional strategy used the analogy of the puzzle, suggesting how the pieces could be shaped to fit together. The resulting patterns — such as the C-, U-, and L-shaped designs listed by García — were then named and identified as structural solutions to the practical problem of layout (García, 1981, p. 35).

The *aesthetic* strategy was justified by the shop window analogy. The newspaper front page, like a store window, showed off the wares of the business and tempted the consumer to enter and purchase.* The headline typo-graphy was compared to clothing on display, meant to appeal to the reader (Allen, 1947, p. 50). In the first several revisions of the standard editing textbook, Gilmore, like García, Arnold, and the other writers of design and layout texts, repeatedly justified layouts by citing their "pleasing" quality (see Gilmore, 1976, Chapter 5 Makeup). Other textbooks have added to this gloss a more abstract and aesthetic justification. They provided a vague but impressive list of principles of design, including such classical concepts as balance and contrast (compare Baird and Turnbull, 1964; Nelson, 1972; and Conover, 1985).

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*Of course, the analogy is flawed because store windows invite the consumer to enter and make choices, whereas the newspaper must be purchased before being "entered." The newspaper became a commodity with restricted access.

Tradition, technique, and taste — these three threads bound together the logic of layout. Editors supposedly chose between competing traditions, and, within each tradition, they chose among several technical solutions. The textbook writers described these choices as taste options, almost invariably labeled as either old-fashioned or modern. The newer style was signaled approvingly as more "attractive" and was invariably introduced with a buzzword.[†]

From these texts journalism students learned to work in the following fashion: Considering the page as the frame, they figured out which stories and pictures needed to fit. Using established and traditional patterns of layout, they arranged and sized the text and pictures, finally writing and configuring headlines before sending their plan, in the form of a coded "dummy" sheet, to the back shop for composition and printing. Their reasoning was essentially practical and traditional, but when asked to justify their work, they could provide an explanation based on pleasing the reader (taste) or appealing to abstract standards of unity, contrast, rhythm, balance, or the like (aesthetics).

Visual Education

What is clearly absent from the procedure is visual literacy — an analytical and conceptual approach that takes into account the expressive, symbolic, and ideological nature of visual images and of visual arrangements of text and image. This lack is the driving force behind some of the general textbooks in visual communications (Berger, 1989, and Morgan and Welton, 1986), but such an approach is not central to training students who specialize in journalism. Rather than incorporating visual literacy, the newest journalism textbooks emphasize current newspaper techniques (such as charts and color, not strictly new, but newly introduced to newspapers by *USA Today*) along with changing styles (Finberg and Itule, 1990). The new crop of professional textbooks once again stumps for the new "in" look and against the older style that is now "out."

The most common application of visual literacy to mass communications has been to train viewers, first of film, and more recently of television. But newspapers are also visual forms —

> Even print itself is coming to be regarded as a visual medium. Layout, design and typography are widely understood to be a significant part of the total communication process, whilst even the term 'print-media' is frequently a misnomer, since in most texts print is rarely unaccompanied by visual images (Masterman, 1985, p. 13).

The trend in media education has been to inoculate viewers, placing them in opposition to the media by exposing its moral inferiority, its manipulative power, its class and economic advocacy, its mystique in the individual consciousness, and its institutional structure (Bennett, 1976, and Halloran and Jones, 1988). These approaches have explanatory power, but their oppositional nature makes them more appropriate for dissuading students from a career in journalism.

To survive in a professional school of journalism, visual literacy must at least begin within the liberal values of the profession, such as accuracy and objectivity. An appropriate approach in this context would begin with fundamental skills — the ability to observe with care and talk about images with the relatively neutral vocabulary of forms — before introducing critical concepts. (This "applied arts" approachis described in Barnhurst, 1987a.)

[†] Allen (1947) used "streamlined," Arnold (1969) called his "functional," and García (1981) coined "structural" and used the initials CVI, for "Center of Visual Impact." The most recent example is Ames (1989), who uses TPC, "Total Page Concept."

The Case at Illinois

In 1986 the course in graphic arts for journalists at the University of Illinois was being revised using visual literacy as a framework. In outline, the course would begin by teaching students how to draw, how to appreciate art in museums, and how to analyze the abstract and expressive forms of visual images from art. After covering these fundamental skills of observation and analysis, the course would provide practical exposure to the sorts of visual tasks found on the job — selecting type, creating logos, taking pictures, and designing charts. The assembling of these images into layouts could then be taught as an expressive and analytical process of visual communication. Later, in the discussion of their practical experiences in the course, students would begin to understand the institutional, social, and political constraints on the visual work of journalists, as well as theories of its manipulative and mythic powers.

By expression, we do not refer to the specific movements in art history usually grouped under the rubric *expressionism*, but to the broader notion springing from those movements, especially from the abstract schools of expressionism, that arrangements of visual elements evoke moods and recall cultural symbols. Applied to the communication arts, this notion translates roughly that the arrangement of items on the page expresses what matters (cultural values and ethical judgments) about the words and pictures. That is, by doing a layout, an editor expresses something significant about the story.

In the early stages of developing the curriculum in the journalism department at Illinois, we wanted to test the visual literacy training being provided to answer several questions. Were students — advanced undergraduates with course work in reporting and more or less experience with student newspapers — relying on technical, traditional, and aesthetic reasoning when doing a layout? What kinds of layouts were they doing? Would visual literacy training change those layouts? And would it increase their reliance on expressive modes of reasoning? To find the answers, an experimental study was devised, similar to performance testing described in job training literature (See Gardner, 1981, for example).

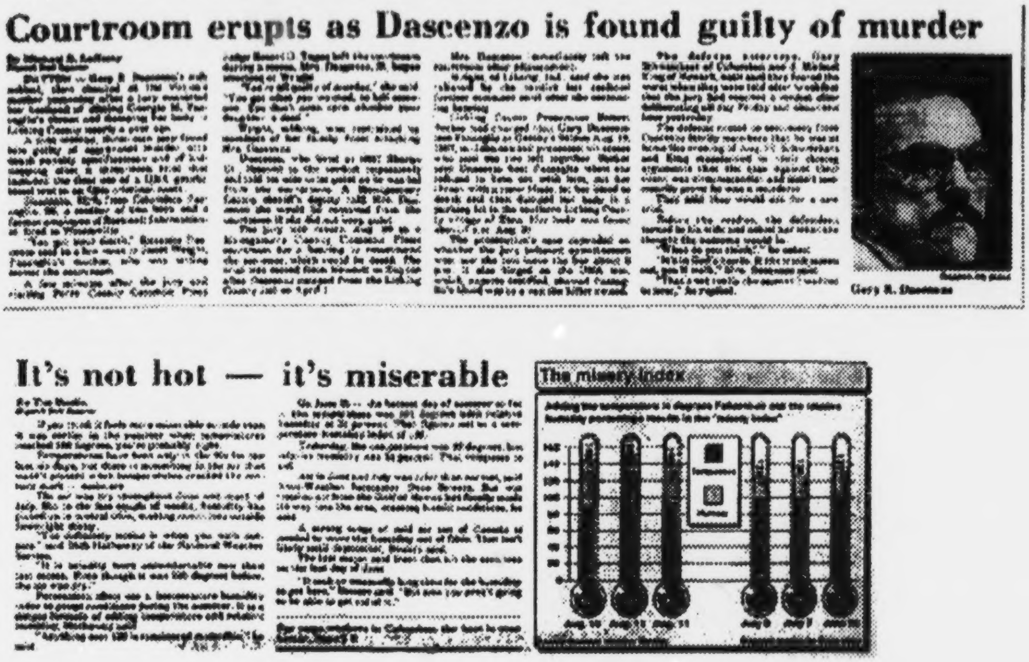
Thirty-one undergraduates and graduate students in journalism were given one of two stories selected from the front page of a Midwestern daily they were unlikely to have seen (See Fig. 1). Half received the text type for a "hard," or *news*, story — the top story on the page — about a murder trial. The other half received the text type for a "soft," or *feature*, story — from the bottom of the front page — about warm weather. They were also given the words (but not the typography) for the headline. Each story included a visual image, a mug shot of the man on trial with the murder story, and an informational chart with the weather story.

After the students created a layout from these elements, they were asked to write down their reasons for laying out the story as they did. They also filled out a form with their background and experience.

The post-test was conducted fifteen weeks later, at the end of their semester of visual literacy training. The procedure was identical, except that no demographic data was collected and students laid out the alternate story. Those who did the murder

Figure 1. Newspaper Articles Adapted for the Study

From long strips of type. students laid out one of two stories, shown here as they appeared Sunday, Aug. 14, 1988, p. 1A. Reprinted, with permission, from the Columbus, *Ohio,* Dispatch.



Courtroom erupts as Dascenzo is found guilty of murder

Gary R. Dascenzo

It's not hot — it's miserable

The misery index

story on the pretest did the weather story on the post-test, and vice versa.[*]

Each author independently coded the reasons students gave for laying out the stories as they did. Besides technical, traditional, aesthetic, and expressive reasons, some comments referred not to the layout itself but to how the story should have been written or edited. These editing reasons were, in fact, irrelevant and stemmed from our attempt to keep the instructions to the students as non-directive as possible. Where the authors disagreed, as we did on about 10 percent of our initial assessments, we met and discussed items until we agreed. In five cases, all in the pretest, we were unable to assign a reason to any category.

Finally, a graduate research assistant[†] also coded the formal qualities of the layouts produced by the students in both the pretest and post-test. The form analysis consisted of five dimensions for each layout: 1) Its underlying line(s) of grid structure, as either horizontal, vertical, or brace (t- or l-shaped); 2) the shapes of objects within the layout, such as pictures and the text blocks, as either all rectangular, brace, or circus (irregularly shaped); 3) the shape of the external silhouette of the entire layout, as either "modular" (rectangular), brace, or circus; 4) the directionality of the overall shape or silhouette, as either horizontal, square, or vertical; and 5) the scale retained the original size, made it larger, or made it smaller. This system follows previ

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[*] The data includes one student who mistakenly did the feature story on both the pretest and post-test.

[†] Mary Jo Knapik

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ous work by Barnhurst (1987b and c), adapting the terminology of professional newspaper makeup to formal concepts from the applied arts.

Although this was largely an exploratory study, we did begin with three hypotheses:

> *Hypothesis 1:* After a semester's instruction in visual literacy, students would give more reasons for why they did a layout in a particular way.

Our reasoning here was that instruction in the vocabulary of form, the relationship of form to content, and the expressive potential of layout, should broaden or expand the number of rationales the students gave for their work.

> *Hypothesis 2:* After a semester's instruction in visual literacy, students would be more likely to cite expressive reasons for their layouts, and proportionately less likely to cite traditional, technical, and aesthetic ones.

This was in fact our "acid test" for the instruction. The course was designed to expose students to the possibility of seeing their work as a form of expression, rather than merely as an exercise in technique that followed personal tastes or industry traditions. If they learned that an editor inevitably expresses values, *says something*, with layout, then they would be more aware of what they themselves express with their own layouts, and they would explain those reasons.

> *Hypothesis 3:* After a semester's instruction in visual literacy, students would produce more-varied layouts.

With this hypothesis, we proposed that the post-test layouts would have greater variation than the pretest layouts, based on the five form-analysis variables. If layout is a mode of expres-sion, the course taught, then there is no single right way to lay out a particular story. Instead, the layout would vary with the editor's goals and values. We expected the students' layouts to likewise vary with their reasoning about goals and values.

Results

Table 1 shows the reasons students gave for doing the sorts of layouts they did. The data show that technical, editing, and traditional rationales predominate in the pretest, before visual literacy training, and especially that virtually no expressive reasons are given for the layouts. In the post-test, however, three-quarters of all reasons are expressive ones, with other categories vanishing into relative insignificance.

Table 1. Reasons Given for the Layouts

The means and standard deviations on the pretest and post-test for rationales students used to explain their layouts.

	Pretest		*Post-test*	
	Mean	*Std. Dev.*	*Mean*	*Std. Dev.*
Technical	1.52	1.288	.32	.475
Traditional	.74	.631	.065	.359
Aesthetic	.29	.693	.065	.250
Expressive	.13	.341	2.45	.888
Editing	.87	1.48	.32	.475
Total	3.47*	1.90	3.23	.990

Total excluding uncodable responses is 3.25.

As Table 1 notes, the mean number of reasons given in the pretest exceeds the number in the post-test, and, if uncodable pretest reasons are excluded, the means are virtually identical. Thus Hypothesis 1 is not supported. Our *post hoc* explanation for the failure to support our first hypothesis is an experimental artifact: There appears to be a threshold demand effect, whereby students gave the number of responses they intuitively considered necessary to satisfy the experimenters.

Table 1 appears to confirm our second hypothesis, that students in the post-test are significantly more likely to cite expressive reasons, and significantly less likely to cite other reasons for doing the sorts of layouts they did (Chi-square = 101.3, 1 d.f., p=.0001). A few of the expressive reasons they cited are shown in Table 2.

Table 2. Samples of Expressive Reasons

The basic reason I laid them out the way I did was it's a hot topic and to make it a little more cool I decided to lay it out horizontally.

Left the chart fairly large because I think it is more interesting than the story.

I wanted to leave the layout as vertical as possible because of the energy in the story, due to high temps. But the chart on the side makes it wider and not as extreme.

The line created by the direction in which the subject is looking leads the reader to the beginning of the story.

This is a very emotional, attention-getting story. Therefore a vertical layout was appropriate.

The story was not hard news or even very interesting. Therefore, I wanted to use the layout to liven up the news.

Other analyses not shown on the table also indicated no confound was introduced by the counterbalanced design; that is, the feature story generated no more, and no fewer, reasons overall, or of any specific type, than did the news story. Moreover, neither the students' training in other journalism or art and design courses nor their practical experience in school or other publications, had any relation to the number or kinds of reasons they gave on either the pretest or post-test.

Table 3. Form Analysis of the Layouts

The number of students employing specific attributes of form in pretest and post-test layouts.

Structure	*Horizontal*	*Vertical*	*Brace*
Pretest	20	1	10
Post-test	4	7	20
Shapes	*Rectangular*	*Brace*	*Circus*
Pretest	10	13	8
Post-test	25	5	1
Silhouette	*Modular*	*Brace*	*Circus*
Pretest	21	5	5
Post-test	8	13	10
Direction	*Horizontal*	*Square*	*Vertical*
Pretest	12	8	11
Post-test	7	6	18
Art scaling	*Smaller*	*Original*	*Larger*
Pretest	2	20	9
Post-test	11	19	1

The third hypothesis was that, in the formal analysis, post-test layouts should feature greater variety among students than pretest layouts on the five features coded. Those results, presented in Table 3, show that only for external shape or silhouette of the layout is the hypothesis supported. In the pretest, two-thirds of the students employed a modular layout, but in the post-test fewer than half employed any one style. There were, however, notable shifts on several other formal characteristics. Overall lines of structure, for example, moved from roughly two-thirds horizontal (and one-third brace) in the pretest to roughly two-thirds brace in the post-test. Internal shapes, roughly balanced among categories in the pretest, moved disproportionately to rectangular in the post-test. Finally, on both tests, two-thirds retained the original sizing of the art. Those who did change it moved in different directions, from larger in the pretest to smaller in the post-test.

Our *post hoc* evaluation of the third hypothesis would be that the hypothesis itself is too crude and insensitive a measure. To some degree, these results may reflect the students' shift away from traditional reasoning (See Fig. 2). In the "modular" style widely used in the industry, the typical story has text in irregular internal shapes and art sized large, all of which fits into a horizontal rectangle. That was the pattern followed by many students in the pretest. But in the post-test they moved in unpredictable directions, all of them different from the traditional style. The hypothesis predicting greater variety was inadequate to reflect the complexity of their responses. We need to think further about the impact of visual literacy training on layout in this context.

Overall, then, the findings present a mixed picture. Our first hypothesis, that visual literacy training would allow students to produce a more detailed rationale for their designs, was not supported, for reasons we think are artifactual. Our second, and key, hypothesis, that visual literacy training would simultaneously stimulate expressive reasoning and suppress traditional and technical reasoning, was strongly supported. Our third hypothesis, that visual literacy training would stimulate, in the aggregate, more varied designs, received little and mixed support.

Discussion

Given the milieu of journalism, the students' strong response to visual literacy training is encouraging. The obstacles to visual literacy for student journalists are formidable in the existing social context. In the common sense of the term literacy, visual skill has not been considered essential in society for functional literacy or proficiency, which includes reading, writing, speaking, and listening, but not watching or viewing or seeing critically or intelligently.* Society has generally defined journalists as not just functionally literate but proficient. Notwithstanding the fact that their work takes visual form, journalists have not needed to be visually literate, at least not historically.

Journalists could justify their news judgments by articulate standards accepted by the industry (for example, explaining that the highest value story goes at the top of the page), and they could enumerate the constraints imposed by their publisher on typography and layout (top story goes on the left, for example, with a headline of a given size). Adler's description of the process at the *New York Times* twenty years ago described their traditional and technical reasoning (Adler, 1971, pp. 148–151). Usually these patterns were justified as reader preferences. Readers were said, despite the inherent paradox, to be most interested in, say, war news, and to always look at the top, right (or, at some newspapers, left) corner for the big story. Institutional constraints were occasionally acknowledged, but not the expressive, symbolic, or ideological aspects of visual communication.

Non-professional media education, on the other hand, has attempted to train readers, not journalists. Young people in the schools have been taught — often in programs designed or sponsored by the newspapers themselves — to use and appreciate the newspaper (and other media) and admire reporters and editors; or, sometimes at the same time, they are trained to make moral judgments about news stories and to rank newspapers and media forms according to standards such as accuracy and neutrality. In this moralistic literacy training, the media are viewed as forms lower than, say, books and opera. In its more sophisticated incarnation, non-professional media education focused attention on analysis and criticism by teaching students to decode the structure of messages and symbols in the newspaper. Masterman and others analyzed the patterns of industrial organization, the political context, and the underlying social values that found expression in media forms such as the newspaper (Masterman, 1985).

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*See, for example, the Adult Performance Level study funded by the U.S. Office of Education and subsequent Harris survey verification reported by Delker (1984, p. 32).

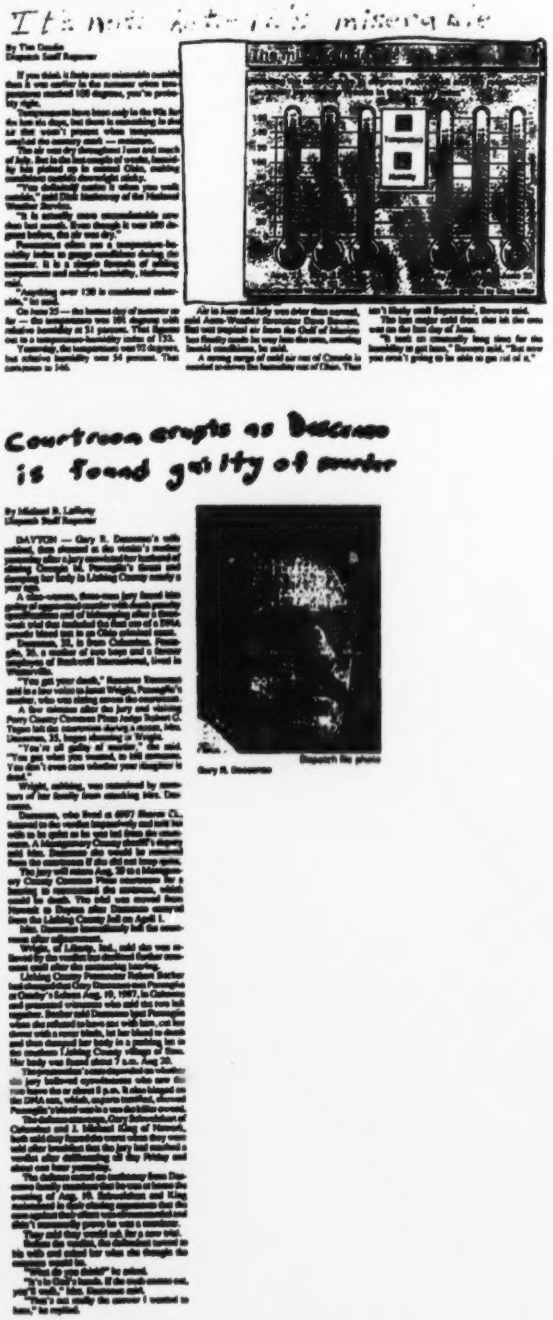
Professional practitioners have been generally hostile to this critical approach because they themselves are characterized as cogs in a machine dominated by industry, politics, and culture. They resist the media education approaches because they are just doing a job, not consciously expressing an ideology. When visual literacy concepts have entered newspapers at all, it has been through the hiring of visual artists, who perform the layout tasks formerly assigned to editors. For example, Jane Harrigan's recent description of a day in the life of the *Boston Globe* describes how designers work and think.

> Baker is resigned to the fate of his efforts. "I'm not creating art," he says. "I'm working with stories to convey them visually."
>
> . . .
>
> The designers read all the stories that will go on the page and experiment endlessly . . . in an effort to convey just the right mood (Harrigan, 1987, pp. 119–120).

The graphic designers generally work isolated from the newsroom. They must necessarily follow some traditional and taste patterns of journalism, but their

Figure 2. Sample Pretest and Post-test

One of the students, Gene Tolli, did layouts that are representative. On the pretest (top), he followed "modular" layout and enlarged the art. His post-test was vertical, with an irregular silhouette.



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Journalism students learn to conduct visual critiques of news layouts at the University of Illinois.

approach is essentially expressive — asking how to say with images what the writers have said with words. Journalists and journalism students have not been trained to take the same approach.

Clearly, from the time they begin their training, these journalists are engulfed by their social and cultural context, and ideological criticism must strike them as unjust and unfounded. To the degree that they work without critical training — without visual literacy — they really are doing a technical job, and the gloss of taste does little to inform the process with a critical or even a communicative sense.

The goal of visual literacy training under these circumstances would be to expand the repertoire of concepts available to editors to understand and explain what they do when they create a layout. It should also make them aware that the forms they choose express cultural values. Besides the functional and traditional explanations, overlaid with some notions of taste and a vague aesthetic vocabulary, editors might develop an appreciation for the expressive and symbolic powers of layout, a sense that the selection and arrangement of type and pictures on the page says something in itself and says something about the news. Given the analytical tools, they can develop sufficient visual literacy to view the layout process as expression and communication of their own values and the values of their publishers, the news industry, and their society. This insight then invites their own ethical analysis of their work and of the role of journalism in society.

Visual literacy empowers viewers and readers, although it doesn't, of itself, change what is available to be read or viewed. Our study suggests that, when given visual literacy training, students of journalism shift their thinking dramatically. For professional practitioners, visual literacy may not change the limitations imposed by institutions and custom, but it may empower them nevertheless. Additional research with professionals in the newsroom is needed to explore this possibility. Instead of simply viewing their layouts as technical solutions or traditional patterns, free from values and ethics, visually literate journalists may connect a newly acquired knowledge of visual expression to the other literate proficiencies, judgment, and ethical concerns. Visual literacy may permit professional practitioners to modulate their presentation of news according to these concerns, rather than simply following the dictates of technical patterns or traditional habits. And, in the end, visual literacy might allow journalists to alter what we read and view in the media.

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Effects of Visual Exercises on Visualization Skills in an Introductory Engineering Graphics Course

Sally Trethewey
John Belland

The major purpose of this study was to explore possible ways that computer generated graphics could improve visualization skills within a university learning environment. A secondary purpose was to aid engineering and technical graphics educators involved in teaching the technology of graphical representation. Changes in adjusted posttest scores for the Flexibility of Closure and Mental Rotations Test were used to measure these changes.

The study was conducted with Engineering Graphics 204 students enrolled Spring Quarter, 1990 at The Ohio State University. The two intact sections of the class were randomly assigned to the two levels of treatment, working alone or with a partner. The two groups viewed a video and used a computer program which generated objects which were rotated on the screen. The students who worked with a partner were encouraged to discuss how they anticipated the object would look when rotated. The students who worked alone did not enter into a discussion about their ideas. The students then rotated the object on the computer and compared their idea with the computer generated image. The students also drew the objects to scale on acetate and then compared them with the rotated version of the object. The treatment took place during two class periods which were scheduled with one day in between.

The students were pretested and posttested with the Flexibility of Closure and The Mental Rotations Test (see Table 1). The levels of visualization ability, low, middle and high, were determined by the pretest scores for the Flexibility of Closure and a paper folding task (see Table 2). SPSS-X was used to analyze the data. A t-test was run for initial group comparisons (see Table 3). Analysis of Covariance (with pretest scores as the covariate) was used to determine significant differences in posttest scores. A post hoc one-way Analysis of Covariance was used to analyze significant interaction with a post hoc Tukey HSD follow up.

The following null hypotheses were tested with results as reported below:

Ho_1: In the population, there was a significant difference between the treatment

Table 1
MEAN PRETEST AND POSTTEST SCORES FOR FLEXIBILITY OF CLOSURE AND MENTAL ROTATIONS TEST BY TREATMENT AND LEVEL

Flexibility of Closure	n	Pretest x	Pretest SD	Posttest x	Posttest SD
Alone	19	79.16	26.07	119.90	22.43
Low	4	43.50	12.90	103.00	24.80
Middle	8	73.00	7.01	110.00	5.66
High	7	106.57	11.13	140.86	18.22
Partner	26	71.23	25.95	101.62	24.57
Low	11	45.36	9.94	81.09	21.05
Middle	8	80.25	11.18	111.63	15.45
High	7	101.57	9.24	122.43	9.34
Entire Sample	45	74.58	26.00	109.33	25.15***
Mental Rotations					
Alone					
Low	3	15.00	1.73	22.67	3.06
Middle	6	17.50	9.42	21.83	10.72
High	4	28.50	7.05	31.50	7.19
Partner					
Low	10	13.90	8.41	23.10	8.84
Middle	7	26.43	7.66	26.86	8.49
High	11	23.18	5.65	26.46	9.58
Entire Sample	41	20.56	8.76	25.24	8.84***

p = .001

Table 2
RANGE OF SCORES FOR FLEXIBILITY OF CLOSURE AND PREFOLD BY LEVEL

	n	Score	Cum Percent	Level
Flexibility of Closure	15	30-62	31.9	low
	16	64-92	66.0	middle
	16	93-162	97.9	high
	5	missing		
Total	52		100.0	
Prefold	5	5-12	28.8	low
	21	13-16	69.2	middle
	16	17-20	100.0	high
Total	52		100.0	

Table 3

MEANS AND STANDARD DEVIATIONS AND T TEST FOR DEMOGRAPHIC INFORMATION ON THE TREATMENT GROUPS

Source	n	x	SD	t	p
GPA				1.71	.09
Alone	20	2.90	.52		
Partner	30	2.67	.43		
Age				1.57	.12
Alone	20	20.75	2.20		
Partner	31	19.97	1.38		
Quarters of previous drawing				.47	.64
Alone	20	6.00	4.66		
Partner	32	5.41	4.31		
Quarters of geometry				-.77	.44
Alone	20	1.55	1.43		
Partner	31	1.84	1.21		

groups on recognition posttest scores as measured by the Flexibility of Closure. Those individuals who worked alone scored significantly higher than those who worked with a partner.

Ho$_2$: In the population, there was no significant difference measured between males and females on recognition posttest scores as measured by The Flexibility of Closure when grouped by those who worked alone or with a partner. There was no significant interaction between sex and treatment.

Ho$_3$: In the population there was no significant difference measured among the low, middle and high levels on recognition posttest scores as measured by the Flexibility of Closure when grouped by those who worked alone or with a partner. There was no significant interaction between level and treatment.

Ho$_4$: In the population, there was no significant difference measured between males and females when grouped by low, middle and high levels on recognition posttest scores as measured by the Flexibility of Closure. There was no significant interaction between level and sex.

Ho$_5$: In the population, there was no significant difference measured between groups working alone or with a partner on manipulation posttest scores as measured by the Mental Rotations Test.

Ho$_6$: In the population, there was no significant difference measured between males and females on manipulation posttest scores as measured by the

Mental Rotations Test when grouped by those who worked alone or with a partner. There was no significant interaction between sex and treatment.

Ho7: In the population there was no significant difference measured among the low, middle and high levels on manipulation posttest scores as measured by the Mental Rotations Test when grouped by those who worked alone or with a partner. There was no significant interaction between level and treatment.

Ho8: In the population, there was no significant difference measured between males and females on manipulation posttest scores as measured by the Mental Rotations Test when grouped by low middle and high levels.

There was significant interaction between level and sex. Females in the three levels but not males showed significant posttest differences on the Mental Rotations Test with pretest removed. There was a significant difference at the .05 level between low and middle females and a significant difference at the .01 level between middle and high females. No significant difference was found between low and high females.

DISCUSSION

The significant findings for the hypotheses will be discussed in the following paragraphs The null hypotheses 1-4 dealt with the Flexibility of Closure test. The

Table 4

POSTTEST SCORES FOR FLEXIBILITY OF CLOSURE BY SEX AND TREATMENT

		Means	
	n	Unadjusted	Adjusted
Sex			
Male	25	111.04	110.42
Female	20	107.20	110.67
Treatment			
Alone	19	119.89	116.78
Partner	26	101.62	104.31

ANALYSIS OF COVARIANCE: POSTTEST SCORES WITH PRETEST AS THE COVARIATE

Source	ss	df	MS	F
Covariate (pretest)	17199.838	1	17199.838	77.027
Main Effects				
Sex	1.335	1	1.335	.006
Treatment	1688.489	1	1688.489	7.562 **
Interaction	3.795	1	3.795	.017
Residual	8931.868	40	223.297	
Total	27824.000	44	632.364	

** $p < .01$

null hypotheses 5-8 correlate with hypotheses 1-4 but were for the Mental Rotations test instead of Flexibility of Closure. For this reason hypotheses one and five will be compared and so on.

Hypotheses 1 and 5

When comparing the analysis for hypotheses 1 and 5 it is interesting to note that while there is a significant difference between the treatment groups at the .01 level for Flexibility of Closure (see Table 4), there is no significant difference measured between the treatment groups for the Mental Rotations Test (see Table 5). For the Flexibility of Closure, those students who worked alone scored significantly higher (.01) than those who worked with a partner. No such differences were found for the Mental Rotations Test.

Perhaps this difference can be attributed to what each test is measuring. The Flexibility of Closure was chosen to represent the recognition category, while the Mental Rotations Test was chosen to represent the manipulation category. The recognition category only requires one to perceive, retain and compare two dimensional visual stimuli, while the manipulation category requires one to work across two *and* three dimensional planes (Sexton, 1989.). Thus, the

Table 5

POSTTEST SCORES FOR THE MENTAL ROTATIONS TEST BY SEX AND TREATMENT

MEANS ON POSTTEST SCORES

	n	Means Unadjusted	 Adjusted
Sex			
Male	23	26.65	24.70
Female	18	23.44	24.13
Treatment			
Alone	13	25.00	23.99
Partner	28	25.36	24.84

ANALYSIS OF COVARIANCE: POSTTEST SCORES WITH PRETEST AS THE COVARIATE

Source	ss	df	MS	F
Covariate (pretest)	1255.167	1	1255.167	25.371
Main Effects				
Sex	5.966	1	5.966	.121
Treatment	.019	1	.019	.000
Interaction	82.275	1	82.275	1.724
Residual	1781.025	36	49.473	
Total	3127.561	40	78.189	

addition of the three dimensional plane, for manipulation, may have made the manipulation task enough more difficult to account for the differences in their adjusted posttest scores between the recognition and manipulation categories as represented by The Flexibility of Closure and The Mental Rotations Test.

Continuing this line of thought, the treatment task itself may account for the significant improvement in recognition scores. During treatment, each student was asked to view an object on the computer screen and then to anticipate in his/her mind how the object would look once it was rotated a given number of degrees in a given direction. The students then rotated the object, by pressing a function key, and compared the rotated image with the image that they had created in their mind.

Ideally, once the students pressed the function key, the image would disappear and immediately be rendered in its rotated three dimensional form. Unfortunately, we were unable to get SilverScreen™ programmed to do this. Once the function key was pressed, the image was rendered first in wireframe and then as a three dimensional solid drawing. Since Zavotka (1985) found that viewing wireframe could depress the visualization scores for naive learners, students were asked to cover the monitor with a paper, which was taped to the top of the monitor, until the rotated figure had completed the rendering process. All students, regardless of their skill level, were asked to cover the monitor. However, many of the students were fascinated with the wireframe rendering phase and had to be reminded to cover their screen. Since the wireframe closely resembles the embedded figure tasks presented in the Flexibility of Closure Test, perhaps viewing the wireframe rendering actually benefited some students.

An additional reason why significance may have been found for the recognition test and not the manipulation test is that the Flexibility of Closure is normed for older students than the Mental Rotations Test. Thus, it may be more sensitive and better able to measure differences between the two groups at a college level then the Mental Rotation test.

For the Flexibility of Closure the students who worked alone scored significantly higher than the students who worked with a partner. The literature is mixed as to which way iconic or verbal is best for training visualization skills. Some suggest that visualization involves a combination of both visual (iconic) and verbal (symbolic) memory codes (Kosslyn, 1978; Reed, 1974.). This would suggest that the group that worked with a partner and was able to both view the object and discuss how it would look when rotated would do better than the group that worked alone and was not encouraged to verbalize their thoughts. Perhaps the reason the students who worked alone did better is that they may have paid more attention to the wireframe as they were not distracted by conversation during the wireframe rendering phase.

Another reason for this difference could be that the group that worked with a partner did not listen as carefully to the directions given by the researcher and instructor. The students who worked alone appeared to listen more carefully and follow the directions much more precisely. The group that worked alone stayed together and were much easier to manage and guide. The students who worked with a partner were frequently at different places in there activities, this group was much more animated than the group that worked alone. An additional reason that the alone treatment group scored higher could be that these individuals were able to work at their own pace and the make appropriate choices for their needs without having to wait for a partner to be ready to progress.

Hypotheses 2 and 6

Given that females tend to be more verbal than males, one would expect that females who worked with a partner and were encouraged to talk would show significant improvement in their visualization scores.

In comparing null hypotheses 2 and 6, there was no significant difference measured among the adjusted mean posttest scores on the Flexibility of Closure posttest scores (see Table 4) or the Mental Rotations test (see Table 5) between treatment groups when grouped by sex. However, the p level (.056) for the Flexibility of Closure would indicate that this is an area that bears further research at a later date. Perhaps the fact that the

Table 6
MEAN POSTTEST SCORES FOR FLEXIBILITY OF CLOSURE BY LEVEL AND TREATMENT

	n	Means	
		Unadjusted	Adjusted
Level			
Low	15	86.93	116.23
Middle	16	110.81	109.56
High	14	131.64	108.71
Treatment			
Alone	19	119.89	118.49
Partner	26	101.62	104.51

ANALYSIS OF COVARIANCE: POSTTEST SCORES WITH PRETEST AS THE COVARIATE

Source	ss	df	MS	F
Covariate (pretest)	17199.838	1	17199.838	79.565
Main Effects				
Level	94.156	2	47.078	.218
Treatment	1776.341	1	1776.341	8.217**
Interaction	628.291	2	314.146	1.453
Residual	8214.551	38	216.172	
Total	27824.000	44	632.364	

** $p < .01$

Table 7

MEAN POSTTEST SCORES FOR THE MENTAL ROTATIONS TEST BY LEVEL AND TREATMENT

	n	Means	
		Unadjusted	Adjusted
Level			
Low	13	23.00	27.56
Middle	13	24.54	23.45
High	15	27.80	25.20
Treatment			
Alone	13	25.00	25.64
Partner	28	25.36	25.16

ANALYSIS OF COVARIANCE: POSTTEST SCORES WITH PRETEST AS THE COVARIATE

Source	ss	df	MS	F
Covariate (pretest)	1255.167	1	1255.167	24.355
Main Effects				
Level	108.505	2	54.253	1.053
Treatment	3.409	1	3.409	.066
Interaction	11.542	2	5.771	.112
Residual	1752.219	34	51.536	
Total	3127.561	40	78.189	

Flexibility of Closure was normed only for males (Sweetland, 1984) could be a contributing factor.

Hypotheses 3 and 7

There was no significant difference measured among the low, middle and high levels on the Flexibility of Closure (See Table 6) or the Mental Rotations Test (see Table 7) adjusted posttest scores when grouped by those who worked alone or with a partner. These results contradict Solomon's theory (1979) that the naive learner's score would increase when media modeled the transformational codes while the sophisticated learner scores would depress. One would expect to see a change among the low and high levels.

Hypotheses 4 and 8

In examining hypotheses 4 and 8, there is no significant difference between males and females on the Flexibility of Closure (see Table 7) or the Mental Rotations Test (see Table 8). This contradicts the finding of McGee (1979). He found that males scored higher than females on the Mental Rotations Test. When grouped by low, middle and high levels, the analysis of the data indicated that there was a significant interaction effect between level and sex for the Mental Rotations Test but not the Flexibility of Closure. Among females there was a significant effect for level, but not among males.

In this study there was a significant difference in adjusted posttest scores for females between

Table 8
MEAN POSTTEST SCORES FOR FLEXIBILITY OF CLOSURE BY SEX AND LEVEL

	n	Means	
		Unadjusted	Adjusted
Sex			
Male	25	111.04	109.29
Female	20	107.20	110.27
Level			
Low	15	86.93	118.78
Middle	16	110.81	108.70
High	14	131.64	101.87

ANALYSIS OF COVARIANCE: POSTTEST SCORES WITH PRETEST SCORES AS THE COVARIATE

Source	ss	df	MS	F
Covariate (pretest)	17199.838	1	17199.838	71.654
Main Effects				
Sex	.031	1	.031	.000
Level	5.000	2	2.500	.010
Interaction	1497.628	2	748.814	3.120
Residual	9121.524	38	240.040	
Total	27824.000	44	632.364	

Table 9
MEAN POSTTEST SCORES FOR THE MENTAL ROTATIONS TEST BY SEX AND LEVEL

	n	Means	
		Unadjusted	Adjusted
Sex			
Male	23	26.65	25.10
Female	18	23.44	26.10
Level			
Low	13	23.00	27.68
Middle	13	24.54	22.72
High	15	27.80	26.40

ANALYSIS OF COVARIANCE: POSTTEST SCORES WITH PRETEST AS THE COVARIATE

Source	ss	df	MS	F
Covariate (pretest)	1255.167	1	1255.167	36.680
Main Effects				
Sex	10.564	1	10.564	309
Level	109.714	2	54.857	1.603
Interaction	593.140	2	296.570	8.667***
Residual	1163.466	34	34.220	
Total	127.561	40	78.189	

*** p = .001

the low or naive learner and the middle level; between the middle and sophisticated or high level; but not between the low and high level (see Tables 10 and 11). This indicates that the treatment was much more effective for female students who began the study with lower visualization skills. Finding instruction which is especially effective for learners with lower initial skills is a rare event in instructional research. These findings should be both put to use and studied further. It is worth noting that the level for the study was determined by the Flexibility of Closure pretest, *not the Mental Rotations* pretest.

These findings are contrary to the findings of Zavotka, (1985). She found no improvement on The Mental Rotations Test among the home economics college students. Zavotka's study was similar to this one in that students watched a video in which objects rotated and changed from three dimensions to two dimensions. Perhaps the success of this treatment can be attributed to the fact that the video in this study used multicolored canonical objects while the canonical objects in Zavotka's study were monochromatic. Her study did not include student interaction with a computer. The treatment in this study was moresophisticated in terms of graphic capability and was more interactive. This could account for the different results.

These findings support previous work by Belland and Trethewey (1989) that visualization skill is trainable, and can be improved via computer generated images. Belland and Trethewey found significant improvement in fifth grade females following a series of activities that involved interaction with a computer. Both

Table 10

POST HOC ANALYSIS OF INTERACTION FOR THE MENTAL ROTATIONS POSTTEST SCORES BY LEVEL AND SEX

		Posttest Means	
	n	Unadjusted	Adjusted
Males			
Low	6	28.17	30.47
Middle	7	27.57	27.03
High	10	25.10	23.34
Females			
Low	7	18.57	24.41
Middle	6	21.00	18.32
High	5	33.20	30.04

POST HOC ANALYSIS: POSTTEST SCORES WITH PRETEST AS THE COVARIATE

Source	ss	df	MS	F
Covariate (pretest)	145.03	1	145.03	3.13
Males by Level	140.31	2	70.15	1.51
Covariate (pretest)	1072.45	1	1072.45	73.58
Females by Level	377.15	2	188.58	12.94***

p = .001

Table 11
POST HOC ANALYSIS OF INTERACTION FOR THE MENTAL ROTATIONS POSTTEST SCORES FOR FEMALE BY LEVEL

	n	Pretest Means	Posttest Means	
			Unadjusted	Adjusted
Females				
Low	7	11.14	18.57	24.41[a]
Middle	6	20.67	21.00	18.32[ab]
High	5	21.20	33.20	30.04[b]

[a] Adjusted posttest scores significantly different at alpha =.05
[b] Adjusted posttest scores significantly different at alpha =.01

studies asked the subjects to anticipate how a three dimensional object would look when it was rotated to a new position. Both studies also asked the subjects to draw the object to scale on acetate; however, the previous research by Trethewey asked the student to anticipate how the object would look when it was squashed or stretched. This study added a video which modeled the rotation of the three dimensional objects rotating in space to the computer interaction used in the previous research.

IMPLICATIONS FOR TEACHING AND RESEARCH

Research

This study used a treatment which was a composite of techniques found to be effective in previous research. Although significant findings were reported, it is difficult to identify exactly how much of a difference any one factor in the treatment made. Future research could attempt to tease out the contribution of the computer and the video to the overall findings. It would be interesting to have one group only see the video and another group only do the computer activities. The video treatment could be further refined by varying the frequency and amount of time for viewing. Subjects could also be given control over the video, by allowing them to play back any sections that they would like to review.

Many of the engineering graphics students who took part in this study expressed their frustration with their visualization ability. They thanked the researcher for helping them to improve their skills. These students also said that they thought this intervention would have been more helpful if it had been offered during their first engineering graphics class (this was at least the second engineering graphics class for these students). A longitudinal study could be done, following this intervention, for those students who have already chosen mathematics or science as a career, namely engineering graphics students.

It would be interesting to do a follow up study with these students to see if they have greater success in their chosen careers of engineering or industrial design. Ideally the intervention would take place early in the first quarter of the introductory engineering graphics class. These students would then be followed for two to two and one-half years following graduation to see if they have greater success then students who did not get the intervention.

Extending the concept of a longitudinal study, a research question that builds on this study is: How would 5th grade students who are totally naive in terms of computer graphics improve in their ability to visualize as a result of this treatment? It would be interesting to have a longitudinal study follow these fifth grade females to see if there is an increase in mathematics and science career choices for the treatment group as compared to a control group.

Current research shows that, in the general population, differences in spatial ability and its relationship to mathematics and science performance are becoming negligible (Lynn & Hyde, 1989). However, this research does not address the relationships for specific populations. The present study does indicate some relationships within this more narrowly defined population. Furthur research is needed to detail these relationships.

Teaching

One of the purposes of this study was to offer suggestions for engineering and technical graphics educators involved in teaching the technology of graphical representation. This purpose can be broadened to include all educators interested in improving the visualization skills of their students. Thus, some of the techniques suggested here could be used by teachers at the elementary through college level to enhance visualization skills.

The main components of this study will be presented in the following paragraphs. A video should be used to model how three dimensional objects rotate in space. The objects used in the video should be canonical, or different when viewed from each side. The simplest objects should be presented first. The video should also model the three dimensional object changing from three dimensions to two dimensions. The students should be cued that this is what will take place in the video. Students should follow the video with computer activities that allow them to rotate objects on the computer screen. Each student should have his or her own computer. The three dimensional objects presented on the screen should be solid not wire frame. The object also should be canonical. The students should be encouraged to anticipate how the object will look when it is rotated to its new position. They also need to be given the opportunity to draw the object to scale and then compare it with the rotated object.

Computer assisted drafting skills will continue to advance as software and hardware becomes more sophisticated. Cyberspace, which allows one to move about in three dimension space via the computer, is a recent development which demonstrates the rapid change and growth of the computer technology. It is important that those individuals who are involved in the educational process continue to question and research how the technology can be designed so that it benefits the learner in the most efficient and persistent manner and so that the learner can take the most effective advantage of the technology.

CONCLUSION

The findings of this study indicate that the treatment was much more effective for female students who began the study with lower visualization skills. Finding instruction which is especially effective for learners with lower initial skills is a rare event in instructional research. These findings should be both put to use and studied further.

Although Linn & Hyde would dispute the link between visualization ability and mathematics and science careers, there is a clear need for visualization skills for students who choose engineering or industrial design as a career. Since the ability to visualize is a trainable skill, students who have low visualization skills can improve and thereby increase their chances of succeeding in their chosen career. This study provided evidence for the success of a low-cost, short-term, one-time-only training experience which will improve engineering graphics students' opportunities for success in engineering and industrial design.

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A Study Of Communications In Business Colleges

William J. Gibbs
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INTRODUCTION

Effective written and oral communication is essential for success in business. Wheatly and Maddox (1985) point out that managers spend 50%-90% of their time in communication with supervisors, subordinates and others. Writing and public speaking skills are so important that many business colleges now offer courses in these areas. However, today's business competition demands more. Improvement of one's capability at writing and speaking, although highly worthwhile efforts, does not appear sufficient. Not only are today's managers required to be competent in written and oral communication, they must also possess fluency in visual communication. Dwyer (1978) points out that:

> "the spoken and written word alone has been found to be an unreliable medium for optimum communication between and among individuals who have had limited opportunities for sharing identical concrete experiences".

To improve the communication process, visuals to aid the presentation of thoughts and ideas, appears useful. Accordingly, Griffin and Whiteside (1983) state,

> "to communicate increasing large amounts of information to more individuals in the most efficient manner possible, the use of visuals to aid communication, is a frontier that appears promising but is still uncharted".

To further elaborate on the use of visuals in presentations let us turn to a major research study from the Whorton Applied Research Center which explored the use of overhead transparencies. The study titled, A Study of the Effects of the Use of Overhead Transparencies on Business Meetings, explored:

a.) the utilization of overhead transparencies and how they influenced presenters' persuasion of the audience on meeting decisions.

b.) how presenters were perceived in a more favorable light when incorporating overhead transparencies in their presentation.

The significance the findings hold for business managers and business colleges who are preparing future managers, is that visuals used for presentations can increase an individual's communication effectiveness. As Griffin (1990) cites upon review of the study's findings,

"visualization increases a person's ability to communicate and improves an audience's ability to retain information."

Effective communication is fundamental in today's business world. Written, oral, and visual communication are recognized as essential components for communication. Given that these elements of communication are critical in the business environment and that 50%-90% of business managers' time is consumed in communication, to what extent do business college prepare managers in communications?

PURPOSE OF STUDY

The purpose of this paper is to report the extent to which concepts related to written, oral, and visual communications are being taught in business colleges throughout the United States.

The study was conducted to determine what is being taught in American business colleges in the area of oral, written and visual communications. From this inquiry, it was hoped that one could determine:

- *the emphasis business colleges place on oral, written, and visual communications.*

- *the concepts taught related to these categories of communications.*

- *the extent to which business colleges prepare managers in business communications.*

- *specifically, the emphasis business schools place on the role of visualization in the communication process.*

Data obtained from this investigation could be utilized by schools to assess their business communications curriculum in relation to other colleges throughout the United States. Data would also provide an analysis of the content of communications courses offered by business colleges which could be used to guide programs in selecting relevant communications course content. Additionally, it could help business colleges to determine the emphasis schools placed on visualization in the business curriculum.

METHOD OF INQUIRY

In July of 1990 a survey consisting of a letter and a two page questionnaire was mailed to the deans of 550 business colleges in the United States. Schools were selected from the American Association for Collegiate Schools of Business (AACSB) directory. The questionnaire consisted of six primary question items. All question items in the survey except for questions # 5 and # 6 presented respondents with a list of choices. The respondent was asked to select the item(s) which best represented their educational institution. Questions # 5 and # 6 required respondents to write in their responses.

The first two items of the questionnaire pertained to the nature (Public or Private) and size of the educational institution.

Item # 3 which was comprised of three subquestions, asked respondents to indicate whether their business colleges incorporated written, oral or visual communications courses as required or as elective within their curriculum. Each topic, was identified on the survey as three separate question items. In addition to identifying whether their colleges treated the communications courses as required or as electives within the business curriculum, respondents were presented a list (for each course) of content areas. From this list they were to select the content taught within each area of communications: written, oral and visual.

Item # 4 obtained information regarding respondents encouraging students' use of audio visual devices when making presentations.

Items # 5 asked respondents to write in the text book(s) they most frequently used when teaching business communications.

Item # 6 specifically, requested respondents to identify the text book(s) they most often use to teach concepts related to visual design or visual communication.

ANALYSIS OF DATA

A total of 193 questionnaires out of 550 were returned for a response rate of 35%. Out of these respondents, 118 (or 61%) were from public institutions, and 74 (or 39%) represented private universities or colleges. This data is shown in Figure 1.

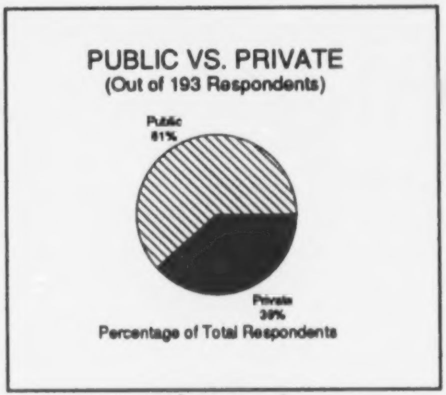

Figure 1

A handful of the respondents (5%) were from smaller universities or colleges, with enrollment of less than 1,000. More than a third, 36%, were from institutions with between 1,000 and 5,000 students. Another 28% were from schools with 5,000 to 10,000 students, and 30% of the sample represented schools with enrollments of over 10,000. This data is shown in Figure 2.

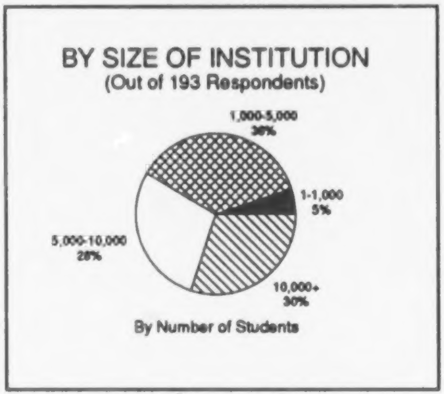

Figure 2

Factors considered when making the analysis of business colleges were: whether the school was public or private; school size; components of communication (written, oral, visual) included as course requirements to be taken within the business curriculum; content taught within communication courses.

It was found that 71% of business colleges surveyed require written communication courses as part of their curriculum and 59% of the schools require oral communications courses. This contrasts with 4% of business college curriculums requiring visual communication courses. In determining the percentage of schools offering courses in written, oral and visual communications as electives, it was found that 13% of the schools surveyed indicated offering written communication courses as electives and 18% offer elective courses in oral. In terms of visual communications, 12% of the business colleges surveyed offer such courses as electives. This data is shown in Figure 3.

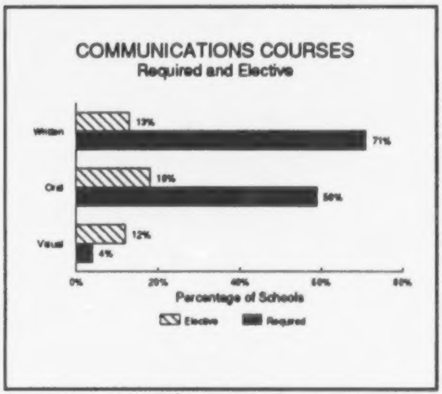

Figure 3

ANALYSIS OF PRIVATE AND PUBLIC INSTITUTIONS

When comparing public and private institutions, the percentages offering written and oral communication courses are fairly similar. In both categories (public and private), 85% offer written communication courses. Accordingly, 73% of public institutions require written communications as part of their curriculum and 69% of private institutions require such course work. Private institutions are slightly more inclined (78% vs. 76%) to offer oral communication courses as either electives or requirements. However, a considerably higher percentage of public institutions, (64% vs. 50%) require such course work as part of their business curriculum. In terms of visual communications, however, public institutions take the lead. The survey finds that 19% of public colleges and universities offer visual communication courses whereas only 10% of private institutions offer these courses. Accordingly, a small percentage, 5%, of public institutions require such course work and only 1% of private institutions mandate visual communication course work. This data is shown in Figure 4.

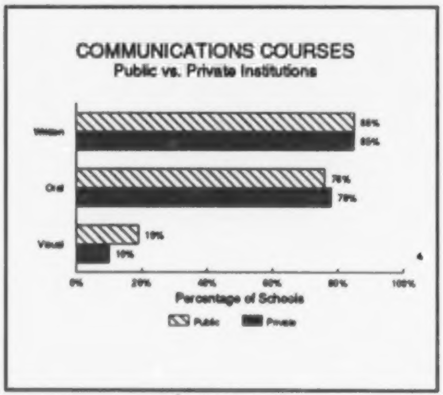

Figure 4

ANALYSIS BY SIZE OF INSTITUTION

The researchers looked at communications in relations to school size. It was expected that larger business colleges would offer more in terms of written, oral and visual communications.

When business colleges are analyzed in reference to their size with respect to written, oral, and visual communications there is a higher frequency of larger schools which offer courses in these areas. In terms of written communication, 91% of schools with 10,000 or more students offer written communications. The survey finds that 81% percent of these business schools require written communications courses as part of their curriculum and 10% offer such courses as electives. Schools with enrollments between 5,000 and 10,000 were less likely,(64%) than larger colleges to require written communications and more likely,(16%) to offer such course work as electives. Of business colleges with 1,000 to 5,000 students, 70% indicated written communications as a requirement within the curriculum and 14% offer it as an elective. Smaller schools with enrollment of less than 1,000 were least inclined (60%) to require written communications as part of the business curriculum and most likely (20%) to offer such courses as electives. This data is shown in Figure 5.

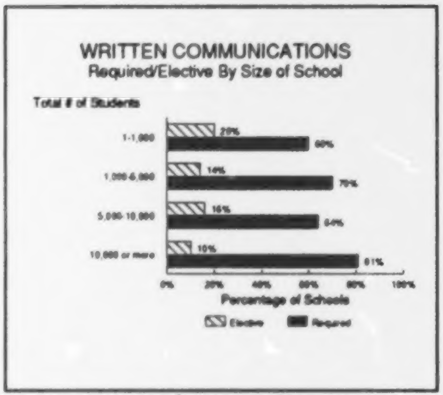

Figure 5

In terms of oral communications, it was found that a higher percentage of larger schools offer this kind of course work. The survey indicates 80% of business colleges with enrollments of more than 10,000 offer oral communications courses. Of these schools 64% require oral communications as part of the business curriculum and 16% offer it as an elective. In comparison, there is a slightly higher tendency (65%) for schools with enrollments between 5,000 and 10,000 to require oral communications as part of the business curriculum. These schools are less inclined (15%), in relation to the larger business colleges, to offer oral communications courses as electives. Business colleges having enrollments between 1,000 and 5,000 are least inclined (50%) of all schools to require oral communications as part of the business curriculum and most likely (21%) to offer it as an elective. Finally, the survey finds that 60% of business schools with less than 1,000 students require oral communications as part of their curriculum and 20% offer it as electives. This data is shown in Figure 6.

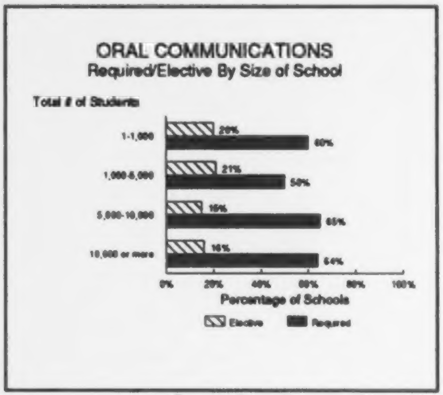

Figure 6

When an analysis is made in terms of school size and visual communications, it is found that the larger institutions show a greater propensity to teach aspects of visualization. Of the respondents from schools with enrollments of 10,000 or greater, 26% indicated that they offer courses in visual communications. Most of these schools (17%) offer these courses as electives. Only 9% are identified as having such course work required in the business curriculum. Schools with enrollments between 5,000 and 10,000 offer slightly less in terms of visual communications. Of these schools, 13% responded as having course work in visualization only as an elective, whereas 7% indicated this course work as being required.

Business colleges with 1,000 to 5,000 students and schools with less than 1,000 students were found not to require (0%) visual communications courses as part of the business curriculum. However, 20% of colleges with less than 1,000 students responded as offering this course work as elective. This contrast with only 6% of schools with enrollments between 1,000 and 5,000 having, as electives, visual communication courses. This data is shown in Figure 7.

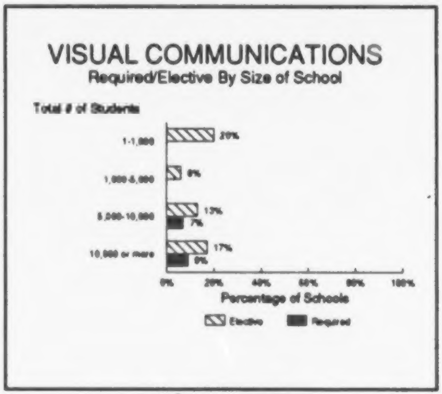

Figure 7

INSTRUCTIONAL CONTENT OF WRITTEN COMMUNICATIONS COURSES

In analyzing the instructional content of written communication courses required in the business curriculum, 54% of the colleges surveyed indicated business writing as part of the course content. English grammar was identified by 37% of respondents as being incorporated into instruction, technical writing by 24% of colleges and proposal writing by 16% of all business colleges surveyed. This data is shown in Figure 8.

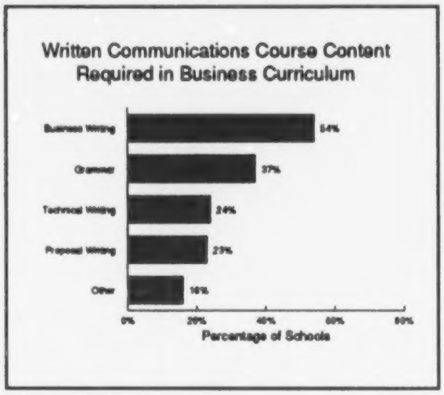

Figure 8

INSTRUCTIONAL CONTENT OF ORAL COMMUNICATIONS COURSES

Of the respondents having identified oral communications courses as part of the business curriculum, 51% indicated that their instructional content contains instruction in planning oral presentations. Accordingly, 49% include instruction in general speaking methods, while 41% teach the effective use of standard audio visual presentation devices. Using visuals effectively in presentations is taught by 38.5% of the colleges surveyed and instruction in concepts of message design is provided by 34% of the schools. A smaller percentage of colleges (23%) teach effective use of business graphics for presentation and only 9% provide instruction in voice training. This data is shown in Figure 9.

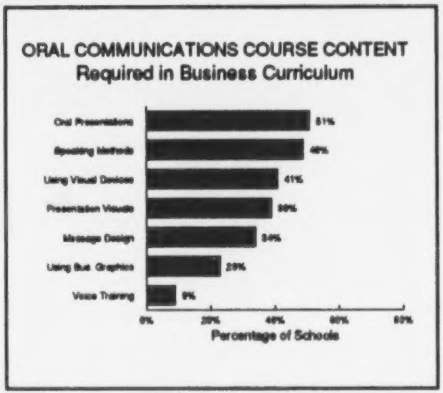

Figure 9

INSTRUCTIONAL CONTENT OF VISUAL COMMUNICATIONS COURSES

Of the colleges responding to having a visual communications component as required in the business curriculum, 2% teach general concepts of visual design, 2% provide instruction pertaining to designing visuals for flip charts, 2x2 slides and overhead transparencies and 2% include instruction relating to designing visuals with computer hardware and software. This data is shown in Figure 10.

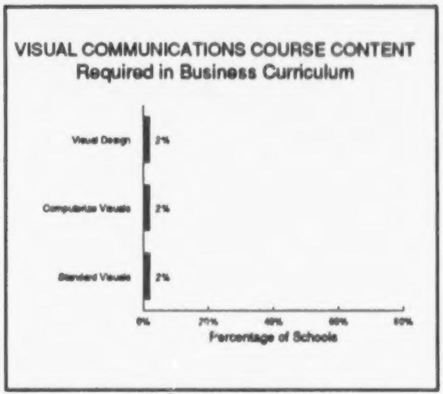

Figure 10

It should be noted that while a low percentage of colleges responded to having a visual communications component within their curriculum, many colleges teach concepts of visualization within their oral communications or Public Speaking courses. Only 2% of the colleges surveyed responded to having a visual communications component in their curriculum, as well as, to requiring instruction in concepts relating to the design of visuals. However, of those respondents incorporating instruction pertaining to visualization within their oral communications/Public Speaking courses, 34% require instruction in elements of message design; 41% require instruction in the use of visual devices; 39% teach using visuals for business presentations; and 23% responded to providing instruction in using business graphics.

While oral communications/Public Speaking courses provide instruction in some aspects of visualization their emphasis appears to focus on the use of visuals in the business presentation rather than the design of visuals for presentations. As indicated, only 2% of the respondents teach the design of visuals for flip charts, 2x2 slides and overhead transparencies. Accordingly, 2% provide instruction in designing visuals with computers and another 2% teach visual design concepts. Conversely, a much higher percentage, (41%), provide instruction in using visual devices with another 39% teaching the use of visuals for business presentations.

VISUAL COMMUNICATIONS CONTENT AND SCHOOL SIZE

An analysis of visual communications course content was made in relation to schools size. It was expected that a higher percentage of larger schools would incorporate such course content. However, more smaller business colleges (1-1,000 students) were found to incorporate content related to visualization than larger schools. When an analysis is made in terms of content area, specifically concepts related to visualization, with respect to school size, a higher percentage of smaller schools offer such content. Of schools with less than 1,000 students, 52% include, within their business curriculum, instruction in concepts pertaining to elements of message design and using visuals for presentations. A significantly lower percentage (36%) of colleges with enrollments of greater than 1,000 offer instruction in elements of message design and 40% provide instruction in using visuals in business presentations. This data is shown in Figure 11.

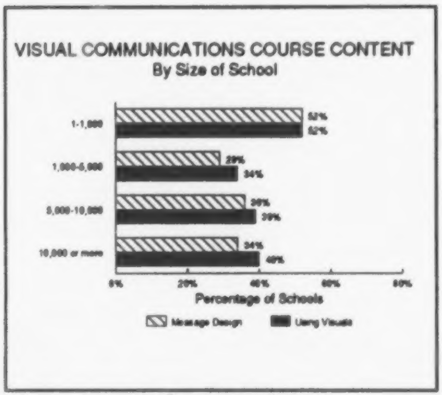

Figure 11

VISUAL DEVICES: BUSINESS GRAPHICS FACILITIES AND SCHOOL SIZE

When respondents were asked if they encouraged students to utilize visual devices such as, slide projectors and overhead projectors when making presentations, 91% responded that they did encourage the use of visual devices. If a yes response was given to this question, then the respondent was asked to elaborate as to where visuals for students' presentations were made. Of the respondents, 27% indicated that the visuals were made on the college campus, 14% indicate the visuals being made off campus and 5% responded that the visuals were made in centers specifically for business graphics. Interestingly enough, there does not appear to be a relationship between larger size of educational institution and having a center for business graphics. Of schools with enrollments of less than 1,000, 10% indicated that they operate a center for business graphics. Conversely, only 3% of colleges with enrollments of greater than 10,000 responded to having a center for business graphics. Colleges with enrollments between 5,000 and 10,000 show the highest percentage, (11%), of operating such a facility and schools with enrollments between 1,000 and 5,000 were least inclined,(1%), to have centers for business graphics. This data is shown in Figure 12.

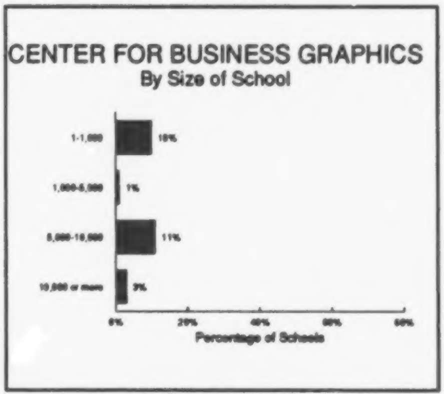

Figure 12

SUMMARY

The survey finds that a large percentage of business colleges incorporate a written and oral communications component within their business curriculum. A much smaller percentage include a visual communications component. It does appear from these findings that many business colleges provide instruction related to visualization within their oral communications/Public Speaking courses. What seems to be emphasized in such courses is the use of visuals in business presentations more so than the design of visuals for presentations.

DATA COLLECTED FROM OPEN RESPONSES

Throughout the survey respondents were given an opportunity to write in any additional content areas not listed in the survey. Sixty respondents provided written responses indicating content taught in written communications classes. Of these sixty respondents 41% indicated that they offer business communications courses and 16% responded as having managerial communications courses.

In terms of software used for designing visuals with computers, respondents throughout the survey cited Harvard Graphics more frequently than other software programs. Nine respondents out of the total surveyed reported either teaching Harvard Graphics or offering it for student use. Desktop Publishing was indicated by two respondents. Other software programs cited were: Lotus 123; Eye Opener; Word Perfect.

IMPLICATION

Implication 1: ***The demands of business mandate proficiency at communicating effectively. In so doing, future business persons will require knowledge and skills in visual communication. It is important for business colleges to effectively prepare managers and business students for these demands.***

From this research it is found that most colleges designate written and oral communications courses for the enhancement of student skills. Business schools are much less inclined, however, to develop students' knowledge and skills pertaining to visual communication. Many researchers contend that while development of written and oral skills are critical to effective communication, fluency in visual communication is equally essential. The exact degree to which visualization is taught in business colleges is unknown. Nevertheless, in relation to written and oral communication, instruction in visualization appears limited. Business colleges should therefore consider emphasizing visual communications to a greater extent in order to assist managers and business students in meeting the demands of competitive business.

Implication 2: ***Instruction in the design of visuals for presentations should be included in visual communication course content, as well as, the use of visuals in presentations. There appears to be greater emphasis in business colleges to teach the use of visuals in presentations rather than the design of visual for presentations. While understanding how to incorporate visuals in a presentation is important, students***

should also be knowledgeable of concepts related to visual design. Understanding what comprises a good visual design, (color, size, shape, etc...),and how that design impacts the audience and their learning, is as important as knowing how to use the visual.

Implication 3*: All concepts related to visual communication need emphasis. Of the respondents surveyed 91% indicated that they encourage their students to use visual devices for presentations. This appears to indicate that business colleges recognize the importance visual devices and associated visual material have to the presentation. Nonetheless, all concepts related to visual communication need emphasis. The visual device itself does not facilitate communication. The use of the device with visual materials, and the design and relevance of those materials to the audience enable effective communication. It would be short sighted to promote student use of visual devices without providing an understanding of associated visuals materials and their effect on an audience.*

CONCLUSION

Research such as this can aid business colleges in assessing their curriculums with respect to written, oral and visual communications. The findings from this study identify what business colleges are teaching in relation to communications, as well as, the extent to which communications is emphasized in business colleges. This research can be used to assist programs in addressing the communications needs of business students.

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Whorton Applied Research Center, University of Pennsylvania, A Study of the Effects of the Use of Overhead Transparencies on Business Meetings, Philadelphia, PA, 1981, p.24

APPENDIX

TEXTBOOK USED FOR BUSINESS COMMUNICATIONS

The total number of respondents that indicated the text book they use for instruction was 88. Of these 88 respondents 14, (15%), use Business Communications by Himstreet and Baty and 9,(10%) indicate using Business Communications Today by Bovee. For a more extensive list of text books refer to the following:

* Business and Administration Communications by Locker - 6%
* Business Communications by Wolf and Kuiper 2%.
* Basic Business Communications by Lesiher - 6%
* Managerial Communications by Munter - 5%
* Successful Business Communications by Treece - 2%

TextBooks Used For Visual Communications

There appears to be no consensus on which text book to use for teaching visual communications. Only eight responses were obtained for this category and each respondent cited a different textbook. Business Communications by Himstreet and Baty were again cited, along with various other textbooks such as, Say It With Charts by Zelanzy and Communication for Results by Hamilton. Other texts cited were:

Aldus Page Maker - Basic Design
Communication and Work by Adler
Business Communications by Gallen and Figgins
Business Communications by Lannon and Dummont
Lotus 123

A Meta-Analysis of the Contribution of Computer-Generated Graphics to Learner Achievement

Ann Cunningham
Roberts A. Braden

Computer-generated graphics (CGG's) offer an attractive alternative to data display that educators have found useful. On the surface it would seem that CGG's also offer the potential for improved learning; but that assumption requires verification. This report addresses the research that has been done to verify, or reject the assumed link between CGG's and improved learner achievement. Educators concur that the teaching-learning process must change significantly based on sound research if our education system is to attain a substantial benefit from the change. Knowing how to relate theoretical knowledge to viable skills is a key to upgrading ourselves and staying current in the use of logical advances in education.

Research studies of the effects of computer-generated instructional graphics promoted widespread controversies with conflicting assumption, findings, and conclusions that require further investigation. Perhaps the most conspicuous aspect, not fully realized by many media comparative researchers, is that computers never have been and may never be a parallel to other forms of instructional media. Computer technology possesses versatility and capabilities far more sophisticated than other media with which it is being compared in the studies.

A meta-analysis (Cunningham, 1988) was conducted in an attempt to integrate the body of existing re-search findings relevant to visual communication in learning, and to examine the external validity of claims about the contribution of computer-generated graphics on measured achievement gains to ascertain its effectiveness in learning. The purpose of this study was to overview the current trend and to prescribe guidelines for future research studies.

METHODS

The methodology in this study partially followed that of another study, "Effectiveness of Computer-Based College Training," by Kulik, Kulik, and Cohen (1980). The investigation was conducted in the following stages:

1. Locating Studies--through computer on-line search, bibliographic search, and all published proceedings of the RTD of AECT (Research and Theory Division, Association for Educational Communications and Technology);
2. Describing Characteristics of Studies--to be illustrated in tables;
3. Quantifying Outcomes;
4. Discussion of Findings.

Locating Studies

The location of suitable studies for this meta-analysis followed a typical data selection/reduction process. For example, when the words 'computer graphics' were entered into the Inspec database, 10,276 documents were available. The number of documents was reduced to 6,807 when the word 'research' was added. A further reduction was made by the word 'instruction or instructional' wherein 27 abstracts were collected. This dramatic decrease in the number of studies appears to indicate that a tremendous number of studies are conducted in areas other than those directly related to the learning with computer-generated graphics. The selection/reduction technique was repeated with the following sources on DIALOG Online Information Service; a) ERIC, Educational Resources Information Center; b) Comprehensive Dissertation Abstracts; c) Compendex, Engineering Index; d) Inspec, Computer and Control Abstract; e) NTIS National Technical Information Service; and f) Psychological Abstracts.

The main criteria imposed for the selection procedure were; experimental research studies, computer augmented instruction directly related to learning, integration of some form of graphics in the learning material, and applicable statistical findings in results. Additionally, the process of narrowing from thousands of documents to a workable set of 37 studies included the following:

1. Those documents that were devoted only to educational experiment and to compare specific computer graphics packages or programs were not included.
2. To be included, each study was required to utilize a computer system as a medium to teach or to conduct the experiments.
3. When a study appeared more than oncein different databases, or different years with very little or no change in the research methodologies and results, only the most recent, complete, and relevant study was considered for the analysis.
4. Studies with serious methodological flaws, unfair criterion tests, and those that were statistically uncorrelative to other studies in each category were eliminated.

In spite of the existence of an overwhelming number of documents related to computer graphics, the final set of studies, even after a second round of computer search, was disappointingly small. A total of 284 abstractswere obtained from the initial search. Following a careful review of the 284 abstracts from the original search, 173 actual reports and documents were selected which were considered useful and relevant to the study. These documents, in turn, were screened to eliminate those that did not meet all criteria for meta-analytic comparison. As a result, 31 suitable studies were identified. The process was repeated, adding six more studies to the database, completing the final set of 37 studies chosen for this meta-analysis.

Twenty-six of the 37 studies were conducted as isolated phenomena, often unrelated to a predetermined curricula, but a segment of a specific subject within each level of academia. For example, an examination of a three-dimensional animation technique in an engineering course might not be required as designated course work, but students were encouraged to pursue an in-depth study in an advanced manipulation of data. In some instances, the studies replaced actual classroominstruction, while others substituted or expanded the on-going instruction. Table I describes the features of methodological characteristics of the 37 studies.

Quantifying Outcomes

The statistical procedure selected as a model system was a study conducted by Kulik, Kulik, and Cohen (1980:532-537). The current study, however, differs from that of Kulik and his colleagues in terms of objectives. The purpose of this analysis was not to merely extract an overall measure of effectiveness that subsists among all studies, but rather to ascertain the relationships between/among variables. Therefore, the technique adopted for this study is a "moderator variables" analysis (Cooper, 1984:83). That is, characteristics were compared within each variable that contributed to the findings, related them to other variables by evaluating "between" interactions, and then examined how the overall effectiveness of computer graphics in learning was influenced by those variables. This scheme was used to "determine the factors that were associated with variations in the magnitudes of the relationships between two variables. Such factors are known as moderator variables because they moderate or later the magnitude of a relationship" (Rosenthal, 1984:13).

TABLE I

Categories for Describing Studies and Number of Studies in Each Category

Categories	Description		Number
Methodological Features	Assignment of Groups:	Random	26
		Other	11
	Environment:	Classroom	23
		Laboratory	14
	Instructor Effect:	Different Teacher	14
		Same Teacher	11
	Tests:	Instructor/Researcher Produced	28
		Standardized	4
		Combination	5
Hardware	IBM or Compatible Systems		5
	Apple Systems		12
	Other		20
Software	Instructor/Researcher Produced		18
	Commercially Produced		14
	Combination		5
	Programming Language:	BASIC	7
		LOGO	3
		PLATO IV	5
		Other	21
Graphics Features	Level of Graphics:	Static	14
		Dynamic	11
		Combination	8
	Screen Display:	Monochrome	7
		Polychrome	21
		Combination	4
	System Control:	Built-in	16
		Learner	18
Study/Publication Year*		1970-1974	1
		1975-1979	4
		1980-1984	7
		1985-1988	25

*Publication date was used when the year of study was not available

The quantifications of the data utilized a secondary data interpretation method. The d-index was used to calculate the computer graphic-enhanced instruction on overall achievement, course completion time, and student attitudes, The g-index was used for the correlation between student aptitude and achievement.

RESULTS

Overall Effects

The technique of secondary data analysis used here involved interpretation of effect sizes (ES) resulting from each set ofprimary research study findings. The ESs are based on computed means and standard deviations descriptive of their sample populations (Cooper, 1984:79). The resulting ES for each variable was then used to relate to the ESs of other variables to examine possible inter-relationships. There were 24 of 37 (see Table II) primary studies which examined the overall effect of computer graphic-enhanced instruction.

In order to combine and evaluate the statistical findings, the effects of treatment (reflected on either the final test or on an average from a series of achievement tests)

TABLE II

Description of Overall Effect Findings

No.	Subject/Topic	Study Description	EffectSize
1	Mathematics	Prior Experience With LOGO vs. Without LOGO	0.628
2	Mathematics	Geometric Concept Learning With LOGO	1.044
3	Mathematics	Color CAI vs. Lecture Presentation	1.006
4	Physiology	Pictorials vs. Without Pictorials	0.241
5	Biology	Field-Independent vs. Field-Dependent	-0.441
6	Science	Text Only vs. Text Plus Animated Graphics	-0.283
7	Language	Computer Drill vs. Flash cards	-0.068
8	Perception	Cuing on Speed, Efficiency & Accuracy	-0.047
9	Business	Decision-Making Process	0.230
10	Perception	Text Only vs. Text Plus Static Graphics	-0.167
11	Engineering	Manual Drawing vs. Computer-Aided Design	0.209
12	Trigonometry	Text Only vs. Text Plus Animated Graphics	0.080
13	Industrial Arts	Workbook vs. Computer Simulation	1.058
14	Communications	Handbook vs. Computer Graphics Training	0.366
15	Statistics	Static vs. Dynamic Graphics in Statistics	0.132
16	Physiology	Line Drawing vs. Line Drawing + Animation	0.308
17	Ecology	Overhead Transparency vs. Computer Graphics	-0.061
18	Physics	B & W vs.. Color Graphics	0.563
19	Mathematics	Word-Problems vs. Animated Graphics	-0.326
20	Health	Conventional vs. Computer Simulation	1.764
21	Industrial Arts	Handbook vs. Computer Graphics	1.176
22	Industrial Arts	Conventional vs. Interactive Graphics	-0.015
23	Home Economics	Film vs. Animated Graphics	0.314
24	Statistics	Static vs. Dynamic Graphics	0.276
Total Effect Size			7.987
Average Effect Size			0.333

were gathered from individual studies and compared with the control groups' achievement scores in terms of the d-index. When a study involved numerous sub-groups undereach control and experimental group, a grand mean was computed before calculating a d value.

The average effect size in the 24 studies was .33, a small effect. In spite of the small effect of computer graphic-enhanced instruction, the magnitude of the effect size varied among studies.

An unanticipated finding was that eight of the 24 studies reported negative effects of computer graphics in learning. In other words, mean achievement rates for CGG-aided learners were less than means of other learner groups who received non-CGG treatments. Five studies, with d value higher than 1.00, however, revealed clear advantages of computer instruction with advanced graphics over traditional teaching strategies.

The Correlation Between Student Aptitude and Achievement

The effect of correlation was evaluated by comparing the scores of aptitude tests, which were measured by pretest, IQ test, or other standardized test, and achievement scores. To quantify the effect, a q-index was computed by transforming the Pearson Product Moment Correlation Coefficient r using Fisher's Z (Cohen, 1977:110-116).

Eight of the 37 studies examined the correlational effect. As indicated in Table III, the average q was -.099, a negligible effect. The result suggests that there is no statistically significant relationship between the different instructional treatment modalities and student aptitudes as they affect achievement scores. The levels of difficulty in instructional content, the range of complexity of the graphics control systems, individual teaching strategies, or non-standard types of testing might have contributed to the wide range of effect sizes.

TABLE III

Correlation Effect Between Student Aptitude and Achievement

No.	Treatment Graphics	Control Graphics	Treatment		Control		Effect Size
			r	Z	r	z	$q = Z_1 - Z_2$
1	Dynamic	Lecture	.28	0.287	.28	0.287	0.000
2	Static	Text	.04	0.040	.14	0.141	-0.100
3	Dynamic	Text	.71	0.887	.68	0.829	0.058
4	Interactive	Static	.96	1.946	.99	2.647	-0.701
5	Dynamic	Static	.76	0.996	.89	1.422	-0.426
6	Dynamic	Text	.29	0.289	.03	0.030	0.269
7	Dynamic	Lecture	.38	0.400	.12	0.121	0.279
8	Dynamic	Lecture	.88	1.376	.95	1.550	-0.174
Total Effect Size							-0.795
Average Effect Size							-0.099

The Effect of Course Completion Time

Seven of the 37 studies reviewed the effect of completion time. The effect was computed by comparing the amount of time spent in computer graphic-enhanced instruction, measured in minutes to complete the assignments, with the amount of time spent in control group in terms of d-index. The analysis showed mixed findings regarding the completion time effect as shown in Table IV below.

TABLE IV

The Effect of Completion Time

No.	Subject/Topic	Graphic Levels:		Effect Size d-index
		Treatment	Control	
1	Reading	Static	Text/Verbal	0.347
2	Trigonometry	Static	Text/Verbal	-0.244
3	Equipment Operation	Dynamic	Text/Verbal	-1.272
4	Physiology	Dynamic	Line Drawing	0.032
5	Radar Jamming	Dynamic	Text/Verbal	-0.833
6	Lab Safety	Dynamic	Text/Verbal	0.638
7	Linear Regression Concepts	Dynamic	Static	0.205
Total Effect				-1.127
Average Effect				-0.161

The average d was -.161, a statistically negligible negative effect size. Based on this study, computer graphic-enhanced instructions did not contribute to any time saving compared to other modalities of instruction. Some of the primary studies examined here included comments regarding the difficulties experienced during their experiments such as system breakdown, interruptions by teachers and technicians, lack of experience in computer technology among the students and teachers, and incompatible testing materials.

Student Attitudes Toward Computer Graphic-Enhanced Instruction

Only six of the 37 studies reported statistically applicable data for this analysis. The rating results were interpreted on a five-point Likert scale. To compute the effect size, the ratings of each study were measured; then the ratings were transferred into the d-index. The average was calculated for an overall student attitude. The results are displayed in Table V.

The average d was .54, moderately significant. As might be expected, the students had a tendency to favor higher level graphic presentations. For instance, when comparisons were made between animated simulation with static graphics or no graphics, the rating of the animated simulation was much higher than the ratings with static graphics.

Other Effects

Studies involved in this meta-analysis revealed similar characteristics of other primary research studies of computer-based instruction in general extrapolated by Brody (1980 a). First, the basis for comparison was usually the perceptual characteristics such as the efficacy on specific commercially developed graphics systems. Second, an emphasis was made on outcomes dealing with either the immediate transfer and replication of information or attitude change. Third, studies which have compared pictorial attributes have attempted to answer questions related to whether or not pictures help increase learning while neglecting how different pictorial variables facilitate learning (Levie 1978). Finally, the experimental testing of instructional graphics design and layout theories has been virtually ignored.

TABLE V

Student Attitudes Toward Computer Graphic-Enhanced Instruction

No.	Treatment Graphics	Instructional Subject	Effect Size
1	Dynamic	Mathematics	0.039
2	Static	Language	1.238
3	Static	Statistical Concepts	1.250
4	Interactive Dynamic*	Engineering	0.350
5	Dynamic	Psychophysiology	0.220
6	Dynamic	Communications	0.169
Total Effect Size			3.264
Average Effect Size			0.540

*In addition to a microcomputer, Interactive Video equipment was used.

Collectively, the findings did not meet the authors' general expectations that high-technology assisted and graphic-enhancedinstruction would not only stimulate the mind but also promote efficient learning. The effect sizes in statistical findings were too small to support those expectations. That is, except for the attitudinal measures, average effect sizes were inadequate for proving that the computer graphic-enhanced instruction was more efficient than other instructional modalities. A positive attitude toward the use of computer graphics has been demonstrated which ultimately may have a beneficial impact upon learning through improved student motivation.

Interactions Between Variables

1. Overall Effect and Correlation Between Aptitude and Achievement

The relationship between the average overall effect size and the average correlational effect size of student aptitude and achievement was virtually nonexistent. That is, the correlational effect size probably would be the same whether or not the groups were assigned on the basis of aptitude test scores. In any event, the relationship with the overall effect size would remain the same.

2. Overall Effect and Effect of Course Completion Time

The treatment groups took a slightly longer time to complete the learning tasks, but scored better on achievement tests. Under better controlled experimental circumstances, the time savings can be projected; thus; graphic-enhanced instruction might become more efficient than other teaching modes. Research to date does not confirm such increased efficiency, however.

3. Overall Effect and Effect of Student Attitude

Despite a general support for the computer graphic-enhanced instruction shown by a strong favoritism toward the technological advancements, the overall effect os student achievement did not interact accordingly. Nonetheless, though statistically small, there was a positive relationship between the strength of students' attitudes and achievement.

4. Effect of Correlation Between Aptitudeand Achievement and Effect of Course Completion Time

A true negative relationship existed between these two variables. The aptitude scores had no bearing on achievement scores and the graphic-enhanced treatment did not save instructional time. For this effect, students have an advantage in a traditional teaching environment with conventional teaching strategies in terms of efficient learning.

5. Effect of Correlation Between Aptitude and Achievement and Effect of Student Attitude

Positive student attitudes had very little effect on aptitude and achievement. Students with varied learning abilities did not profit from the enthusiasm shared among them for CGG-supported instruction.

6. Effect of Completion Time and Effect of Student Attitude

Highly enthusiastic attitudes did not necessarily shorten the length of instruction time. In contrast, in a traditional setting, when students are excited about a certain topic, the attention level is usually high and teaching tasks often require less time as a result.

DISCUSSION

One of the intriguing factors associated with the statistically nonsignificant gains inachievement is that individuals involved in experiments possessed wide differences in background and prior experiences with computers. that diversity may pose a threat to a fair judgement of achievement. Other factors may have contributed to the inconsistent and contradictive findings about CGG when compared with other media or different forms of presentation techniques. For instance, humanistic factors, that are uncontrolled and ignored can pose a threat to the test and measurement reliability. Clark (1986:245) asserted that the single most critical variable in the educational process is the classroom teacher. Salomon (1979:9) observed that the medium of communication makes very little difference in learning, but a collection of attributes, such as intra and inter-personal communication skills physical environment, level of difficulty in instructional materials selected, and symbol employed in instructional materials, affected the final outcome.

According to the conventional wisdom, one of the common causes of inefficiency of CGG enhanced education is a lack of planning coupled with inadequately identified learning objectives. Commercially produced materials are often marketed before their values have been determined, learning theories upon which they are based are oversimplified, and the selection is limited. Furthermore, a majority of educational computer programs with pictorial illustrations are produced for aesthetic value based on creative design concepts and not for their instructional value, which can be counter-productive. These flaws and errors of design have generally served to contaminate the control of variables in the study of CGG supported instruction.

Guidelines for Future Research

Though difficult to accept, based on past studies, the research on media has shown attempts at ascertaining superiority among different mediums implemented n education to be futile. In spite of well conceived researcher intent, statistically non-significant findings persist in evaluation of media effects. Hence, Clark (Winter 1983) has suggested that such attempts need to be put to rest. Research about pictures, on the other hand, deserves extensive examination. The general consensus is that when graphic materials are incorporated in any presentation, they not only assist with the understanding of accompanying verbal materials but also influence other variables associated with the presentation.

The learner's background and prior experience must be considered when developing CBI with pictorial elements embedded in the instructional and testing materials used in the experiment. Although educational software usually utilizes pictorial information, surprisingly little is know about the effect of pictures on CBI in terms of text-image effects. As the ability to easily visualize CBI increases, including the ability to utilize full motion video, more analysis of semiotic variables will be needed. Different approaches in research techniques are needed which focus on pictorial attributes rather than on the entire picture (Brody, 1980b). Dwyer (Fall, 1985) emphasized that the complexity of visual information is not only encoded differently, but also stored and retrieved differently depending on each individual's background and learning readiness.

The effects of graphics upon computerized instruction warrants further study. Importantly, however, research with computer-generated instructional graphics should be planned by first isolating unique technological characteristics and integrating them with proven factors that are involved with the effective presentation strategies in learning.

The following suggestions reflect the findings of this study. They represent recommended guidelines for good practice rather than immutable laws or rules. Based upon the wide-ranging research which was studies here, they are a set of ideas to help shape further research. Several of the recommendations are oriented toward overcoming the problems of interrelating the findings of multiple studies through meta-analysis.

1. Subject area and experimental population surveys should be conducted to ensure the appropriateness of the scope and function of the study.

2. Organization of instructional materials should reflect existing curriculum while matching software to students' abilities and to content difficulty level.

3. Software used in future graphical presentation research should exemplify the positive findings of prior computer-based instruction studies.

4. Control of visual variables should be as rigorous as control of verbal, cognitive-content variables when conducting CGG research.

5. A pre-research orientation is an important step to help prevent unnecessary delays and confusion that might affect the study findings.

6. Pilot studies are recommended to establish the reliability of planned tests and to validate proposed methodologies.

7. The actual experiments need to be conducted under careful direction with complete control of environmental measures and with precise record keeping.

8. In the process of testing and measurement, the researcher must keep in mind that congruent testing is important for precise findings.

9. During the post-experimental analysis, a thorough review must be made to examine the study's completeness and accuracy.

10. The selected data interpretation technique must provide complete and precise findings of the study.

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Effects of Flow Diagrams With Texts on Learning Verbal Chains

Robert C. Branch

This is a report of an investigation about the use of text combined with a flow diagram of equivalent information to teach verbal chains. It is a follow-up to the Branch & Moore (1990) study that examined the ways in which diagrams or texts were used to teach verbal chains and other forms of cyclical information, and where instructive questions were used as prompts (or as information organizers) to enhance the instructional effectiveness of the flow diagram or the text. The groups that received instructive questions as an adjunct to the flow diagram or text scored significantly lower on the comprehension test than the group that did not receive the instructive questions $F(1,125)=8.14$, $p<.05$, consistent with the overprompting theory (Anderson & Faust, 1967; Anderson, Faust & Roderick, 1968; Faust & Anderson, 1967; Holliday, 1981,1983) which basically states that providing students with strong hints to the answers of questions can do more harm than good. The data indicated that student comprehension of verbal chains is inhibited when flow diagrams or texts are employed together with instructive questions, but, did not indicate whether the learning of verbal chains would be enhanced when flow diagrams and texts are presented together. The thesis of this current study was that flow diagrams combined with equivalent texts is a more effective presentation type for learning verbal chains than either diagrams or texts alone. The purpose of this study was to evaluate the potential of flow diagrams and texts to teach verbal chains.

The results of the Branch & Moore (1990) study indicated that flow diagrams were a more effective presentation type than texts, however, the use of instructive questions did not enhance the learning effectiveness as an adjunct to the two presentation types (flow diagram or text). Further, there was no differential advantage between presentation type and the use of instructive questions, thereby, presuming no interaction effect. In addition, absent from the treatments were groups in which the participants studied both the flow diagram and the text passage concurrently, with or without the use of instructive questions as prompts or information organizers. The current study reported here includes two additional treatment variables — a flow diagram and textual passage condition, and a flow diagram and textual passage with instructive questions condition. Thus, the focus of this study examines the effects of a flow diagram and a text passage combined as a single treatment for learning verbal chains.

Diagrams as a Presentation Type

The notion that flow diagrams are more effective than texts when presenting verbal chains is founded upon its primary attribute of having the ability to present spatial relationships of entities which reinforce a predicted response (Dwyer & Dwyer, 1989). Diagram researchers are well aware that visualization is capable of "stimulating curiosity, facilitating organization, illustrating data, focusing attention, clarifying information, stimulating interest, raising questions, spanning linguistic barriers, facilitating retention of information, increasing communication reliability, isolating learning cues, facilitating discrimination, introducing new information and initiating discussion" (Dwyer & Dwyer, 1989, p. 2). Texts may be capable of achieving the same ability to present spatial relationships of entities which reinforce a predicted response, however, diagrams apparently do this more efficiently, but, do diagrams facilitate texts, and vice versa?

The idea that whenever possible, students should be presented the whole picture rather than discrete parts had its beginnings in the Gestalt theory of perception. Research generally supports the use of flow diagrams which make use of pathways or cyclic schema to condense descriptive material into more "intellectually manageable" visual displays (Spangenberg, 1971). Diagrams are a form of picture (Larkin & Simon, 1987) because:

(1) Diagrams can group together all information that is used together, thus avoiding large amounts of search for the elements needed to make a problem-solving inference.

(2) Diagrams typically use location to group information about a single element, avoiding the need to match symbolic labels.

(3) Diagrams automatically support a large number of perceptual inferences, which are extremely easy for humans (p. 98).

A Flow Diagram is a graphic design, composed of descriptive texts, or pictures, or both. Flow diagrams present sequence, identify relations, such as parts to a whole, and explain, rather than represent. A diagram is defined here as evidence of an idea being structured — it is not *the idea* but a model of it, intended to clarify characteristics of features of that idea. A diagram is a form of communication which increases the pace of development, or allows an idea to function and develop for the thinker while offering the possibility of transfer of an idea or triggering of notions: through appropriate structuring, it may generate different notions and states of mind in the viewer (Dwyer & Dwyer, 1989). Holliday (1975) suggested that flow diagrams are especially helpful for recalling components of a pathway or a cyclic schema and for getting the "big picture" at a glance. A chain of words in the texts (detailing for instance the steps in a metabolic pathway) can also provide the basis for such recall. Holliday (1975) hypothesized that a single flow diagram can teach more effectively than either a text description or combination of texts and diagram.

Texts are words; and only words. Texts can be considered as a method to represent meaning, and can be described as a structured list of propositions. Propositions are made up of concepts (which are given word names but should not be confused with the words themselves), and each proposition includes a predicate (or relational concept) (Bourne, Dominowski, Loftus & Healy, 1986). The size, shape and style of textual characters may vary, however, the content information should remain consistent across various text types.

Instructive Questions are questions that are designed to facilitate information organization and serve as adjuncts to presentation types. Three of the six treatment groups in this present study received instructive questions to answer as they studied the presentation material. The instructive questions were intended to serve as prompts or information organizers for the content to be learned from the diagram or the text or both.

Verbal Chains are specific response associations (Stimulus-Response). Gropper invented the term verbal chaining in his 1970 study on diagram types to describe how the probability of responding is increased in which he concluded that the spatial ordering of materials can facilitate the acquisition of long chains — cyclical information. Dwyer & Dwyer (1989) extend the concept of verbal chaining to be contingent upon three conditions:

(1) the number of inputs are limited and the stimulus is presented under conditions commanding attention,
(2) the response required of the learner is contiguous in time, and
(3) the reinforcement as to the correctness or incorrectness of the response is immediate, and correctness procedures are implemented immediately if the initial response is incorrect" (p. 1).

The main issue this current study sought to resolve was, whether diagrams combined with text descriptions is the most effective presentation mode when learning verbal chains. The research question is: What is the effect of presentation type (diagram, or text, or Diagram and text) on verbal chain learning? This report is based on a larger study regarding the effectiveness of flow diagrams with instructive questions as prompts or information organizers.

Methodology

The flow diagram used in this study is a replica of the flow diagram used in previous studies by Holliday (1976, 1981, 1983) and Branch & Moore (1990) which describes four related, scientific pathways or cyclical schemes (Figure 1). The text passage contains the same information as presented in the diagram (Branch & Moore, 1990) (Figure 2). A textual description of the same linkages is typically restricted to the use of nouns, verbs and modifiers and presented in sentence form. The list of instructive questions used in three of the six treatments is of the "fill-in-the-blank" variety and served as an adjunct or prompt to the diagram and/or text presentations. The comprehension test (dependent variable) consists of 24, four-choice items and constitutes a content synthesis of two or more of the units displayed in the diagram or presented in the text.

For the experimental tasks, whole classes were randomly assigned to one of the six treatment conditions. Each participant was asked to study a flow diagram, or a text passage, or both; with or without the use of instructive questions, and to then take a comprehension test on its contents. The first treatment condition (**Text Only**) required the participant to read a passage composed only of prose which described verbal chains of information. The second treatment condition (**Diagram Only**) required the participant to study a flow diagram presenting the same verbal chains as the text only condition. The third treatment condition (**Text & Diagram Only**) required the participant to read the textual passage and study the flow diagram concurrently. The fourth treatment condition (**Text with Instructive Questions**) required the participant to answer questions as they read the textual passage. The fifth

Biogeochemical Cycles

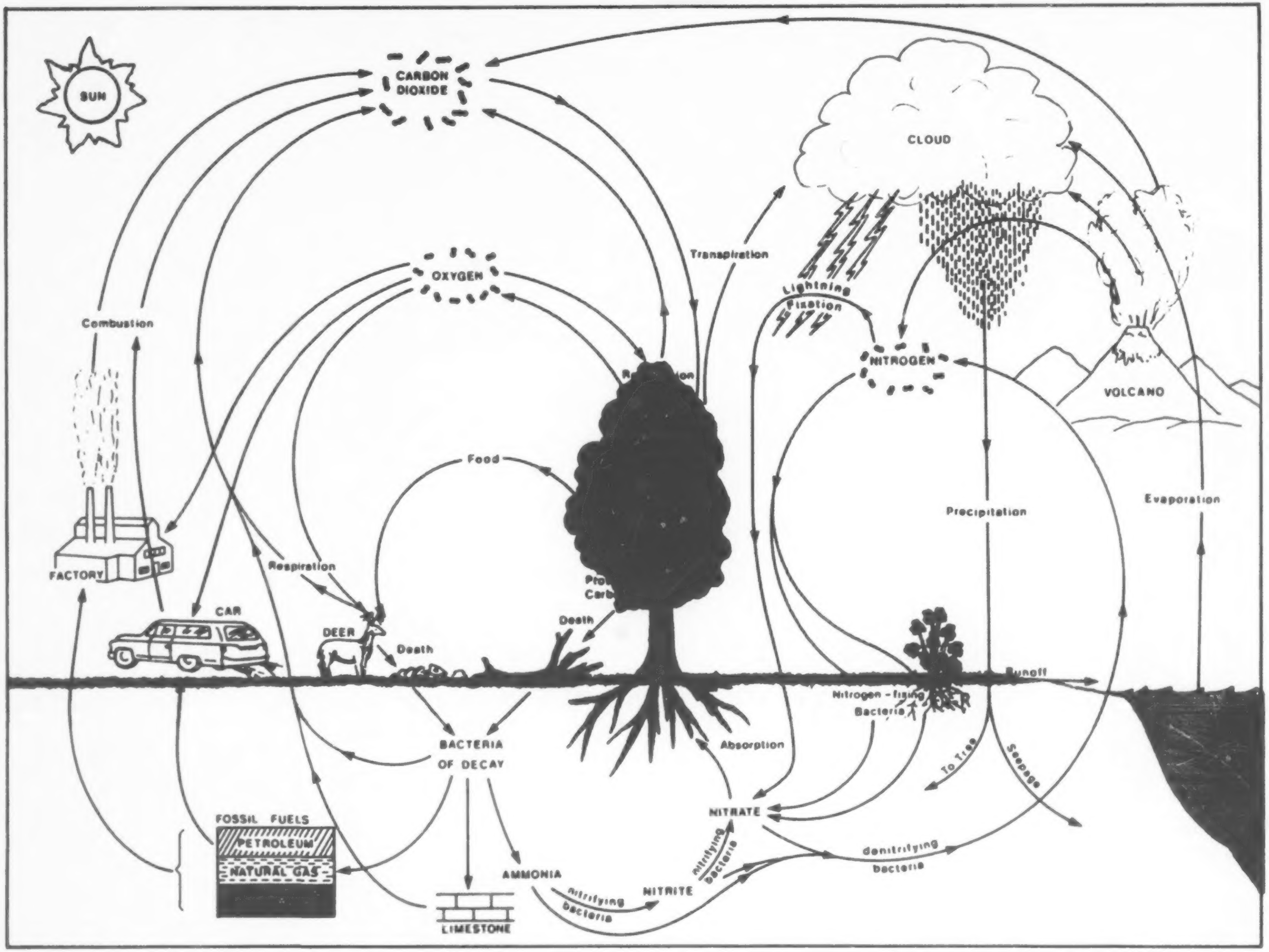
The **sun** provides radiant energy that enables green plants to grow and to make food. Directly, and indirectly, green plants are the source of food for all living things. An indirect source of coal, petroleum, and natural gas was indirectly provided by the sun. These materials were formed by the death and decay of ancient green plants, and recycling carbon from the air. Energy from the sun permits all of the biogeochemical cycles to operate.

Clouds form when moisture in the air condenses on small particles of dust or other solid particles in the air. Moisture from trees and other plant (**transpiration**) form the clouds. Water vapor that condenses and forms clouds often falls to the earth in the form of rain, sleet, snow, or hail. Water that falls from the atmosphere to the earth is called **precipitation**. Some water that falls to the earth goes into the ocean through **runoff**. Some water goes into the ground as **seepage**. Trees and other forms of plant life use the water.

Oceans play an important part in the hydrologic cycle. During this cycle, the sun's rays heat the surface of the ocean, causing the water to enter the atmosphere as water vapor (**evaporation**). Seepage and runoff replenish the water of the ocean.

Trees and other plant life play a central role in the biogeochemical cycles of the earth. Through respiration and photosynthesis oxygen and carbon dioxide are exchanged into the air. Trees provide a source of food such as **protein and carbohydrates**. Bacterial decay are formed by the death of trees.

Figure 2. *Excerpt of three-page text passage.*


SUN
CARBON DIOXIDE
CLOUD
Transpiration
OXYGEN
Combustion
Lightning Fixation
NITROGEN
VOLCANO
Food
Precipitation
Evaporation
FACTORY
Respiration
CAR
DEER
Death
Death
Runoff
Nitrogen-fixing Bacteria
BACTERIA OF DECAY
Absorption
To Tree
Seepage
NITRATE
FOSSIL FUELS
PETROLEUM
NATURAL GAS
AMMONIA
nitrifying bacteria
NITRITE
nitrifying bacteria
denitrifying bacteria
LIMESTONE

From "Teaching Verbal Chains Using Flow Diagrams and Texts" by W.G. Holliday, 1976, AV Communication Review, 24, P. 69. Copyright 1976 by Author. Adapted by permission.

treatment condition (**Diagram with Instructive Questions**) required the participant to answer questions as they studied the flow diagram. The sixth treatment condition (**Text & Diagram with Instructive Questions**) required the participant to answer instructive questions as they read the textual passage together with the flow diagram. All the participants were encouraged to assume normal study habits, including writing notes directly on to the study materials.

Sample

The participants in this experiment were 115 college students enrolled in education classes. The gender distribution was 87 females and 28 males, and the median age was 20. Fifty-one percent of the students reported their grade point average (on a four-point scale) between 2.01 and 3.00.

Instruments

There were four instruments used in this study: a flow diagram (Figure 1) depicting biogeochemical cycles and a three-page-text passage (Figure 2) with information on biogeochemical cycles as in the flow diagram. There was a list of 20 instructive questions that requested the participants to provide a written response, and a 24 item multiple-choice comprehension test (the dependent variable) which included demographic information. The content accuracy and the degree of information equivalency of the instruments used in this study were validated by a panel of four experts who have taught in the field of Earth Science. The individuals on the panel represented a cumulative teaching experience of 67 years at either high school or college level. The comprehension test produced a Kuder-Richardson (KR 20) reliability coefficient of 0.715.

Procedure

Prior to the study of the treatment materials, the participants were informed that a multiple-choice test would be administered at the end of the study period, and that it would be a good indicator of their ability to comprehend the science information. The participants were instructed to study the science information individually for 20 minutes. The participants were encouraged to take notes as they studied the instructional materials. After the study period, the participants were given ten minutes to independently complete the same comprehension test. The instructional materials were not available to the students as they answered the multiple choice questions. The entire experimental process lasted approximately 40 minutes.

Analysis

This experiment employed two independent variables: (1) *Presentation Type*, and (2) the presence of *Instructive Questions*. There is a single dependent variable, the mean score achieved on a comprehension test. This experiment is of a posttest-only equivalent group design. The data collected from the participants is analyzed using a 3 X 2 factorial analysis design. An Analysis of Variance (ANOVA) is used to determine statistical significance [Alpha = .05].

Results

Table 1 provides a summary of the mean scores, standard deviations and number of subjects across all treatment groups. Table 2 contains the summary of the 3 X 2 factorial analysis of variance (ANOVA) of the presentation types and the presence of instructive questions.

The mean score on the comprehension test of the groups that studied the Diagram ($\bar{x}$ =

Table 1

Summary Table of Means and Standard Deviations by Main Effects

N = 115 $\bar{X} = 17.29$

Group	n	Mean	SD
Presentation Type			
Text	39	17.28	4.63
Diagram	39	17.41	3.86
Text & Diagram	37	17.16	2.86
Instructive Questions			
With	56	17.00	2.67
Without	59	17.56	4.69
Text Only	20	17.80	5.97
Diagram Only	20	17.15	4.71
Text & Diagram Only	19	17.74	3.09
Text with Instructive Questions	19	16.74	2.66
Diagram with Instructive Questions	19	17.69	2.81
Text & Diagram with Instructive Questions	18	16.56	2.53

Note: Maximum possible score = 24.

Table 2

Summary ANOVA Table of Presentation Type and Presence of Instructive Questions

	DF	SS	MS	F	p
Presentation Type	2	1.40	.70	.046	.9548
Instructive Questions	1	9.33	9.33	.617	.4338
Interaction	2	17.70	8.85	.585	.5586
Error	109	1647.69	15.12		

17.41) was higher than the mean scores for the groups that studied the Text ($\bar{x} = 17.28$) or both the Text & Diagram ($\bar{x} = 17.16$). However, results indicated in Table 2 show that the main effects of Presentation Type (Text, Diagram, or Text & Diagram) was not significant, F (2, 109) = .046, $p < .05$. The three groups that received the instructive questions as an adjunct to the presentation type ($\bar{x} = 17.00$) scored lower on the comprehension test than the three groups that did not have the use of instructive questions ($\bar{x} = 17.56$), but, the F-ratio for the main effect of the use of instructive questions was not significant F (1, 109) = .617, $p < .05$ (Table 2). Results summarized in Table 2 indicate that there was no significant interaction, F (2, 109) = .585, $p > .05$, therefore, not accepting the hypothesis that there is interaction across presentation type and the use of instructive questions. Figure 3 is a graphical representation of the mean scores for each of the treatment groups.

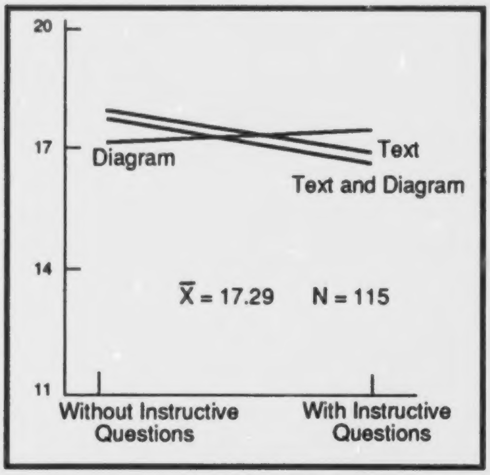


Figure 3. Graph of Main Effects Means

Discussion

The results of the statistical analyses indicate:

(1) Diagrams are a more effective presentation type than texts alone, or than texts and diagrams combined, and
(2) Instructive questions do not enhance learning effectiveness as an adjunct to the three presentation types.

The present study investigated the relationship between presentation type (text, diagram, and text & diagram), and the use of instructive questions to enhance the learning effectiveness of the presentation type on learning verbal chains. Although, overall, there was indicated no differential advantage between presentation type and the use of instructive questions, a closer look at the six separate groups is warranted.

The only group that indicated an increase in the mean comprehension score upon the addition of instructive questions was the Diagram Only group (Figure 3). Looking at Table 1, the Diagram Only group achieved a mean score of 17.5 and a standard deviation of 4.71. The Diagram with Instructive Questions group achieved a mean score of 17.69 (only slightly higher), but, the standard deviation of 2.81 indicates a clustering closer to the mean than for the Diagram Only group, thereby suggesting a potential significant difference between these two groups. Does this mean that learners gained better understanding with the use of instructive questions? It may be enlightening if further systematic investigation compared the achievement of a diagram only treatment condition and a diagram with instructive questions treatment condition. In addition, future investigations about how instructional designers can facilitate information organization through spatial relationships and isolating learning cues with pictures and questions as prompts or information organizers might provide the answers to whether or not diagrams enhance the learning of special kinds of information such as verbal chains.

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Visual Attributes and Cognitive Style: A Program of Research

David M. Moore

Individual student learning differences have been observed in every instructional setting. One of the major objectives in education is to accommodate or reduce the negative effects of these learner differences; media provide a range of options from which appropriate teaching techniques may be chosen. We know that media should not be considered as neutral transmitters of information. Different media structures have differential effects on the learning process. Instead of describing which media are best, it is more appropriate to determine which media attributes affect which learning operations of the student. From this perspective, learning results from an interaction between individual learner characteristics and particular attributes of the instructional medium. Media research has also shown that effectiveness depends upon how a medium is integrated or used systematically with the overall instructional strategy. While theoretically sound and logically compelling, planning and using media well is not a simple matter. For example, to select visuals an instruction designer must consider a visual medium's individual characteristics and what makes it effective, as well as the alternative organizational patterns for delivering instruction with that medium; these attributes must then be coordinated with an array of learner aptitudes.

In the early 70's available data, indicating that learning can be influenced by visual media, were based upon instructional media studies which attempted to determine the superiority of, and student attitude toward, specific forms of mediated instruction. That research was limited because media were undifferentiated and poorly defined relative to educational purpose. In addition, it was clear that individual differences among students and instructional methods influenced learning. To address these issues, a program of research was established on visual media following recommendations proposed by Dwyer which called for "isolation, identification, classification and measurement of those essential stimuli characteristics" of media which when used in combination or alone should improve learning.

Visual Characteristics and Learner Aptitudes. Instructional researchers have been developing an empirical base to integrate unique medium characteristics with the psychological requirements of specific learning tasks. This research, referred to as aptitude-treatment interaction, is based upon the belief that alternative treatments can be devised which capitalize on or match the traits or attributes of learners. The goal is to reduce individual differences in achievement by compensating for students' learning styles or traits while supporting their existing strengths. Earlier researchers investigating the effects of trait measures such as age and grade level on achievement have discovered only modest relationships because the media/learner attributes were not clearly defined.

Although this line of research produced considerable information about the interaction of visual media and learning, there was an increasing awareness that learners' aptitudes must also be investigated relative to their influence on media effectiveness. Considerable research indicated that learners process information differently aside from the gross traits studied earlier, and that people use different means to perceive and react to information. These means of perception, called "cognitive styles" by Divesta, can be manifested in many ways. Two such styles particularly important because they relate directly to visual perception, are field dependency and visual/haptic perception.

Earlier studies had investigated interaction between media and learners, but there was little evidence supporting the use of specific attentional or organizing devices (instructional supports) deliberately designed and employed to take advantage of or to compensate for a particular cognitive style. A critical instructional issue in accommodating cognitive style is matching modes of presentation and visual characteristics with individual learning styles. Using a model by Ausburn and Ausburn and other aptitude-treatment interaction studies, the inquiry with visual media was broadened to investigate how learning, recognition and recall interacted with cognitive style and selected visual characteristics. See Table 1 for summaries of the variables and findings from these studies.

These results sometimes provide inconsistent but useful information for planning visuals. Visuals *do* have recognizable attributes and some appear to interact with visual related cognitive styles. These findings, combined with various presentation possibilities and characteristics of various cognitive styles, can be used to develop guidelines for designing visual materials. Because this research on these visual characteristics was conducted in classroom settings rather than in laboratories, practical applications of the results are facilitated.

The following information about the eight research studies were taken from the actual articles. The information is incomplete. However, the general purpose and pertinent findings are included. Specific information concerning procedures, instruments, analysis and discussion can be found in articles cited in the references.

Study #1. Effects of perceptual type and presentation mode in a visual location task (Whitley and Moore, 1979)

Research has shown that people differ in their psychological orientations toward sensory perception. Opposite perceptual types are extreme Haptics normal-sighted individuals who use their eyes only when compelled to do so and otherwise depend on touch and kinesthesis -- and extreme visuals -- those who depend entirely on visual experiences and would be completely lost in the dark. Since haptics have been shown to have particular difficulty retaining visual images mentally, materials presented in a linear format may be ineffective for them. This study explored the possibility that Haptics would perform better on a visual location task when the materials were presented in a multiple image format.

A correct response in the experiment was the selection of the criterion picture from the group of three similar pictures. The score for each subject was the number of correct responses on the test (0-20).

The dependent variable was the number of correct responses on a visual location task; the independent variables were presentation mode (linear and multiple imagery) and perceptual type (Haptic and Visual).

All three *F* ratios were significant at the .05 probability level. The significant *F* ratio for the interaction argued against a direct interpretation of the main effects. The interaction indicated:

- Visuals scored higher than Haptics with both multiple and linear imagery.
- Haptics scored higher with multiple imagery than with linear imagery.

Study #2. Subliminal perception and cognitive style in a concept learning task taught via television (Moore and Moore, 1984)

The purpose of this study was to investigate the effects of supplemental subliminal captions and field dependence on the recall of cognitive information. Groups of subjects (N = 199) viewed one of four television presentations: subliminal captions only, conventional (visible) captions only, subliminal and visible combined for reinforcement, and subliminal and visible mismatched for interference. Data was analyzed using ANCOVA and Tukey multiple comparison tests. There was a significant difference in recall between field dependents and field independents in each treatment except combined subliminal and conventional captions.

This evidence suggests that repetitive subliminal television captions which supplement visible captions may be an effective device for reducing differences in achievement attributable to cognitive style in learning from television programs. The mean scores indicate there was considerable variation in the recall of field-dependent students across the four treatments, but little, if any, difference in the recall of field-independent students.

The ANCOVA results for main effects, interaction and covariates were all significant. The independent variable presentation mode produced significant differences in recall scores across the treatments $F(3,188) = 2.832$, $p < 0.05$.

Thus, the type of captioning used did influence students' ability to learn concepts presented in the TV program. The main effect for the stratifying variable cognitive style was significant $F(1,188) = 21.46$ $p < 0.001$, indicating that there was a difference in students' ability to learn concepts from videotapes using different captioning methods. Furthermore, the interaction between presentation model and cognitive style also was significant $F(3,188) = 4.79$, $p < 0.01$. Thus certain captioning modes had a differential effect in aiding concept learning by students having various cognitive styles.

Because the F-ratios for presentation mode and cognitive style were significant, a series of multiple comparison tests were performed, using the Tukey procedure for unequal group sizes. Comparing the recall of field dependents only, here was a significant different between the 'subliminal-only' and 'combined' treatment ($Q = 6.85$, $p < 0.01$). No other treatment differences among field dependents were significant. Comparing the recall of field-independent students, there were no significant differences across treatment.

Study #3. Effects of field dependence-independence on size and type of visuals (Moore, 1985a)

This study concerns the effect of field dependence-independence on short term recall of content information from visuals described as photographs, paintings and line drawings of different sizes. It was hypothesized that field dependents would be able to perform better on recall tasks with visuals of less complexity and less distracting information. The results showed interaction between size and type of visual but no significant difference in means due to cognitive style.

Because there were three major factors in this study -- cognitive style, type, and size of picture -- a three dimensional statistical design was used. The dependent variable was the number of correct responses on the questions for each individual picture. The independent variables were cognitive style, size and type of picture. The F-ratios dealing with size of picture $F(2,258) = 23.99, p = .0001$ and type of picture $F(2,258) = 91.31, p = .0001$ were significant. The F-ratio for cognitive style was not significant $F(2,129) = 1.58, p$ .2097. However, the interaction between size ad type of visual was also significant $F(4.516) = 130.96, p = .0001$ and this interaction argues against direct interpretation of the main effects of size and type of picture. The interaction illustrates that:

1. the one-half sized painting had the slightest mean score $\bar{x} = 4.33$) of the paintings as well as overall;
2. the full sized photography had the lowest mean score $\bar{x} = 1.98$) of the photographs as well as overall;
3. the one-quarter sized photographs had the highest mean score $\bar{x} = 3.75$) of the photographs;
4. the one-quarter sized line drawing had the lowest mean score $\bar{x} = 2.55$) of the line drawings; and

5. the full sized line drawing had the highest mean score $\bar{x} = 2.27$)

Study #4. Cognitive style and a subliminally taught task (Moore, 1985b)

Because field independents are more capable of consciously discerning parts of a visual scene and field dependents have more difficulty with a similar task, it was hypothesized that field independents would be able to discern subliminal messages better than field dependents. The repeated nature of the presentation (14 times) and the formal structure of organizing the information (i.e., the seven parts of the puzzle presented in the same order) might increase the importance of context cues and make them more relevant for the field dependent person. Field dependents who were shown the subliminal treatment might in fact do better in completing the task than those field dependents who were not given the subliminal message. The purpose of this study was to test this hypothesis of students' ability to learn a subliminal task whole viewing a non-related film.

A two way analysis of variance was the statistical design used in this study. The F ratio dealing with field dependency (F (2,126) $= .70$, $p = .5007$) was not significant; neither was the F ratio dealing with treatment (subliminal or non-subliminal) (F (1,126) $= .02$, $p = .8822$) nor was the F ratio dealing with interaction between dependency and treatment (F (2,126) $= .74$, $p = .4804$). The mean scores for all groups were quite small considering the possible 0-7 as the criterion score. None of the main effects nor the interaction between cognitive style and treatment were significant.

Study #5. Cognitive style, presentation mode in a visual location task (Moore, 1985c)

The purpose of this study was to determine the effects of viewing multiple and linear images in a visual location task by subjects determined to be field-independent, neutral or field-dependent. The study also considered the interaction of the presentation mode and cognitive style. The results indicated that college students depending upon their cognitive style performed significantly differently in their visual location task.

The college students depending upon their classification as FI, neutral or FD performed significantly different $F(2,126 = 7.91$, $p = .0006$ on the visual location task. A secondary analysis indicated that FI's $\bar{x}=10.55$ and neutral's $\bar{x}=9.53$) *both* scored significantly higher than FD's $\bar{x}=8.20$). The presentation mode (linear vs. multiple presentation) was not significantly different $F(1,126)$ $= 0.79$, $p = 0.37$ in this study. In addition, there was no significant interaction between presentation mode and cognitive style $F(2,126) = .91$, $p = 0.403$. The fact that FI's mean scores was significantly higher than FD's was predicted. However, the results which indicated there were no significant differences in treatment groups was surprising. Added to this fact that FD's actually had higher mean scores on the linear presentation $\bar{x}=8.33$) than on the multiple presentation $\bar{x}=8.05$) was unexpected. Both FI's and neutrals had higher mean scores on the multiple treatment than on the linear presentation.

Study #6. Background cues, order of presentation and cognitive style (Moore, 1986)

This study tested the effects of cognitive style (field dependent/field independent) upon the short term recall of abstract figures seen with different contextual backgrounds. The study further investigated the possibility that one background could be used as a model for recalling abstract figures within another background.

A three dimensional statistical (2 x 2 x 2) design, a split-plot design using repeated measures was employed. A total of 96 subjects were used in this analysis. The *F* ratio for cognitive style $F(1,23) = 25.95$, $p < .001$ was significant. However, no significance was found for background mode $F(1,23) = .05$, $p > .05$ or order of presentation. $F(1,23) = 1.38$, $p > .05$. Also there was no interaction between cognitive style and background mode $F(1,23) = 4.90$, $p > .05$, or between cognitive style and order of presentation $F(1,23) = 1.19$, $p > .05$ or between cognitive style, background mode and order of presentation $F(1,23) = .26$, $p > .05$. There was, however, significant interaction between background mode and order of presentation $F(1,23) = 5.80$, $p < .05$. Thus, it can be seen that:

1) the most effective treatment order is showing treatment with background cues first then treatment without cues;

2) the second treatment no matter what order was more effective than the first treatment.

Study #7. The effects of cognitive style and a supplantation technique on a picture detail recognition task (Blevins and Moore, 1987)

The purpose of this study was to determine the effects of a supplantation technique (zoom) on field-dependent and field-independent learners on a picture detail recognition task in a television presentation.

Two groups of students were shown two videotape treatments: one using a zoom technique which acted as a supplantation device and the second using a no-zoom treatment which withheld the supplantation technique. A posttest only 2 x 2 x 3 repeated measures design was utilized to analyze the data. The independent variables were cognitive style, zoom and no zoom treatment conditions, and learning trails.

Results indicate that the zoom treatment did not produce significantly higher picture detail recognition scores for either field-independent or field-dependent learners. Cognitive style had no significant effect on students' picture detail recognition ability in the learning task presented by television. There was no significant interaction between the treatment and cognitive style.

Study #8. The effects of organization strategy and cognitive style on learning from complex instructional visuals (Reardon and Moore, 1988)

This study investigated the use of varying formats for presenting complex visual information in the form of fictitious maps. Two of the three treatments sequenced map information in differing degrees by conceptual category (i.e., roads, geographic features, boundaries) and the third used a normal intact map format. The cognitive style field dependence-independence was examined as being potentially related to map learning ability. The results of a two-way analysis of variance showed no significant difference in learning among the three formats, but indicated that greater field independence was related to higher achievement on the map learning task.

The act of dividing visual information normally contained in one visual into a sequence of visuals in order to provide the learner with a more manageable amount of information at one time, did not significantly, $F(2,83) = .316, p > .05$, affect performance on a visual learning task.

Overall means for the treatment groups were 40.47 for the Intact group, 41.28 for the Additive group, and 38.88 for the Part-by-Part group. While the mean scores were highest for the Additive treatment, there was no evidence from this study that any one of the three map presentation formats were superior.

There was a significant difference for cognitive style, indicating an association between level of field independence and posttest performance, $F(2,83) = 4.64, p < .05$ on a complex visual learning task. Higher GEFT scores were associated with higher posttest scores. The results of Tukey Multiple Comparison test (for unequal ns) indicated that the significant differences occurred between the field dependent and moderately field independent groups ($Q = 3.96$, $p < .05$), and between the field dependent and field independent groups ($Q = 3.77$, $p < .05$), but not between the moderate and field independent groups. In fact, mean scores for the moderate and field independent levels were similar.

There was no interaction between visual design format (Intact, Additive, or Part-by-Part) and the cognitive style variable field dependence-independence $F(4,83) = .36$, $p > .05$. Thus a single design format was not found to be superior for a particular cognitive style.

Observations

The results of this program of research are not consistent nor always show the efficacy of varying specific visual attributes in the design of visual materials. One underlying purpose was to see if redesigned materials could *assist* those students determined to be field dependent, i.e., people unable to disembed visual information from the whole. While these series of studies appear to indicate a trend that most field independent learners score significantly higher on the various dependent measures tested, the practicality of changing the visual attributes for the benefit of the independent individual is questioned. In fact most of the independent variables (except field-dependence) were not significantly different nor indicated interaction with field dependency.

It is not to say, however, that these studies are not useful. Negative results are just as important as positive findings, i.e., we now know what does not work. This line of research, while organized and planned, has never been presented in one presentation before. Also, these studies have laid the groundwork for additional studies of investigating cognitive style and structure and format of various type of graphs and charts which are being investigated by the author and Tom Head at Virginia Tech University. In addition, these studies described in these pages have been the basis of an initial line of study dealing with attempts to teach observation strategies of field independent individuals to those students classified as field dependent.

Table 1
Studies Investigating Media Attributes and Cognitive Styles Interaction

Study	Media Attribute	Cognitive Style	Findings
Whitely & Moore (1979)	Multi, linear order	Visual/Haptic	1. Haptics scored significantly higher with multi vs. linear presentations 2. Visuals scored higher than haptics with on both modes.
Moore & Moore (1984)	Subliminal captions	Field Dependency	1. Type of captioning did significantly influence subjects ability to learn concepts via television. 2. Certain captioning modes had a differential effect in learning with subjects with different cognitive styles.
Moore (1985)	Size, Type Visual	Field Dependency	1. Cognitive style made no difference in recalling visual content 2. Size and type of picture significantly interacted, however, no interaction between cognitive style and size and type of visuals was reported
Moore (1985)	Subliminal Instruction	Field Dependency	1. Cognitive style made no difference in a learning task taught subliminally 2. No interaction between cognitive style and subliminal instruction was reported.
Moore (1985)	Multi, linear order	Field Dependency	1. Field Independents' scores were significantly higher on a visual location task 2. Field dependent subjects were not aided by either presentation mode, e.g., no interaction was reported
Moore (1986)	Background types	Field Dependency	1. Cognitive style did not interact with background type 2. Showing a background with cues first is the most effective presentation order 3. Field independent subjects scored significantly higher than field dependent subjects
Blevins & Moore (1987)	Zoom, No Zoom TV	Field Dependency	1. Cognitive style did not interact with presentation mode 2. Neither cognitive style nor presentation were significantly different
Reardon & Moore (1988)	Presentation Mode	Field Dependency	1. Cognitive style significantly related to posttest scores 2. There was no difference between type of presentation

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Serif vs. San Serif Type Fonts: A Comparison Based on Reader Comprehension

James S. Lenze

INTRODUCTION

The design of printed materials is taking a new approach. A line of text may be poetic or profound but its capability to impact the mind is not based solely on content. Today, how words look is as important as what they say.

What Jonassen (1982) refers to as external textual structuring can have impact on how text is perceived and understood. The choice of font, the selection of type size, the use of upper or lower-case letters, and highlighting are examples of external textual structuring. It is now accepted that consideration of these structures is an important part of communication through printed materials (Benson, 1985; Jonassen, 1982; Jonassen & Kirschner, 1982; Whiteside, Whiteside, & Griffin, 1989). Within the study of external textual structuring is the choice between serif and sans serif text styles.

What Are Serifs?

Serifs are finishing strokes on the ends of letters. Figure 1. compares a serif H with a sans serif H. One of the serifs on the serif H is circled. It may be hard to imagine, but this tiny letter characteristic is the center of a typographical controversy.

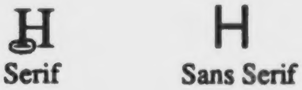

Figure 1. An example of a serif H and a sans serif H. One of the serifs on the serif H are circled.

The choice of serif style or sans serif style text may seem a small consideration. But to those who take document design and writing visually serious the choice of serif or sans serif is an important decision.

Prior to the 1830's serif type fonts were the only choice available (Robinson, Abbamonte, & Evans, 1971). With the sans serif's economical design it could have been imagined that the serif was doomed. Pick up practically any newspaper, text book, or novel and you may begin to wonder why the serif has, not only survived, but continues to flourish.

Research On Serifs

Robinson et al. (1971) offer a few suggestions for the survival of serifs:

1. Conditioning: It may be that those who grew up with serifs in their newspapers and magazines simply choose them out of habit.

This seems to be reasonable but not totally logical. Robinson et al. (1971) point out that if this were true the quill pen would still be our primary writing tool.

2. Horizontal Continuity: I may be that serifs reinforce the linearity of a line of type.

Estes (1978) points out that humans make few eye fixations per line of text, thus letters are perceived in groups, not as individual characters. The lack of continuity, from one letter to the next, in sans serif type fonts, does not appear to an important factor in legibility.

3. More Informative: Since serifs consist of more lines or data ink perhaps they convey more information.

If this were true almost any mark would seem to convey more information. Since the strokes, themselves, do not convey specific information this seems unlikely.

4. Line Detector: The human eye contains a line detector within the retina which "fires" when if stimulated by the presence of a line the visual field.

This concept forms the basis of Robinson's et al. (1971) theory. Though most research on this concept deals with animals (Lettvin, Maturana, McCulloch, and Pitts, 1959) there is some research which substantiates a similar receptor system existing in humans (Schoenberg, Katz & Mayzner, 1970).

Robinson et al. (1971) tested this theory. Their research revealed that serifs help to preserve the original image of the letter making it more legible. In particular they found that serifs are most helpful dealing with smaller letters and least helpful with large letters.

Sansocki (1988) supports an opposite view of serifs from Robinson et al. (1971). His theory rests, in part, on the idea a "good" font is made up of highly regular characters which share common characteristics. He theorizes that the addition of serifs only serves to differentiate characters to a degree which lessens their legibility.

He briefly presented subjects with strings of four unrelated letters and followed them with a patterned mask. The subjects were then presented with two-alternative force choice tests to identify each letter.

He found that subject's ability to select the appropriate letter where greatly increased when exposed to sans serif, or more regular text.

While both of these studies are quite informative there is room to question the applicability of the results. After Sesame Street, few individuals spend much time reading individual letters. Both studies examined readability of single letter forms. Furthermore, Sansocki's (1988) font choices are atypical. Figure 2. provides examples of each of Sansocki's (1988) two fonts.

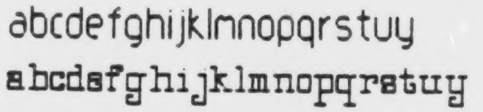

Figure 2. Sansocki's (1988) serif and sans serif fonts.

Notice that the serif font is significantly more ornate than serif font used in this paper. With only a limited time to scan the letter it is understandable that subjects would more easily scan a radically different and simpler sans serif font type.

Reader Preference

Not all work published on the topic of serifs is so decisive. Benson (1985) recommends selection based on the visual texture of the written material. The author would love to have a definition of visual texture. Tinker (1963) supports Benson's (1985) claim that the benefit of serif or sans serif rests in aesthetics rather than physiology. Tinker (1963) compared a variety of type fonts and concluded that there were no legibility differences between serif and sans serif text. Differences were found, however, in preference. Tinker's (1963) study results showed subject preference for sans serif text far outweighed serif text.

Sans serif text is perceived as having a cleaner and more modern appearance than serif text. Serif is perceived as being more familiar and common.

The Question

The research leaves one primary question unanswered:

Is there a significant difference in the legibility of serif and sans serif type fonts in continuous text? This is the primary question the author wished to answer.

METHOD

This study is designed to measure reading speed and comprehension. To measure these aspects a test is used to evaluate the subjects understanding of the material. To try to control for prior knowledge a subject matter of some complexity has been selected. Intelligence, however, is variable which is difficult to control.

Locus of Control

Locus of control can be used as a predictor of intelligence. In this study it is used to determine whether increased speed in comprehension is due to intelligence or font type.

Locus of control involves the concept of where an individual's perceived control lies. Some believe that the "powers that be" control our lives and destinies (external locus of control). Others believe that they themselves are masters of their destinies (internal locus of control).

Lefcourt (1976) maintains that locus of control can be used to predict intelligence to the degree that those classified with internal locus of control seem to perform well in intellectual activities.

Subjects

The experimental group was presented with textual information using a serif text. The control group was presented with the same textual information using a sans serif text. The subject population for the study was university students at the Penn State University.

Design

After subjects received an explanation of the study and signed consent forms they were individually escorted to a personal computer. The subjects then began working through a program, written by the author in HyperTalk, which was already loaded on the computer.

The program first presented Rotter's (1966) 29 item Locus of Control Scale. Subjects were then randomly assigned to either the experimental or control group.

Each subject was then presented, by the computer, with a brief paragraph of information concerning the heart. The heart text was adapted from Dwyer's (1982) heart content. The paragraph appeared for one second. The subject was then asked a question directly related to the previously shown paragraph and asked to type in a one word answer. If an incorrect answer was given the same paragraph was displayed for two seconds and the same question was asked again. For each incorrect answer an additional second was added to the display time of the paragraph.

Once a correct answer was given the subject was shown a new paragraph for one second and the process continued until four questions were successfully answered.

Subjects were then presented with examples of serif and sans serif text and asked which they prefered. The basis of this preference was not asked.

RESULTS

The data used for the statistical computations was obtained from 84 volunteer subjects who participated in the entire study in one of the two test groups. A statistical significant level of .05 was established for retention or rejection of the following null hypotheses.

Ho1: There will be no significant difference in speed of comprehension between those subjects exposed to serif text and those subjects exposed to sans serif text.

Ho2: There will be no significant difference in speed of comprehension between those subjects with internal locus of control and those subjects with external locus of control.

Table 1. illustrates the analysis of variance for the data collected during the study. It also illustrates that no significant differences were found between any of the groups tested. Therefore, both of the null hypotheses are accepted.

It is apparent that neither text type has advantage over the other for enhancing reading speed for comprehension. Furthermore, locus of control appears to have no effect on reading speed for comprehension.

Reader preference did, however, provide some interesting data. Figure 3. illustrates the results of asking subjects to identify which font they prefered when presented with examples of each type.

Analysis of Variance

Source	Sum-of-squares	DF	Mean-square
FONT	899.724	1	899.724
LOCUS	398.327	1	398.327
FONT* LOCUS	255.699	1	255.699
	F-Ratio	P Value	
FONT	1.412	0.238	
LOCUS	0.625	0.432	
FONT* LOCUS	0.400	0.528	
Error	50979.700	80	637.246

Table 1. Analysis of Variance table for all groups.

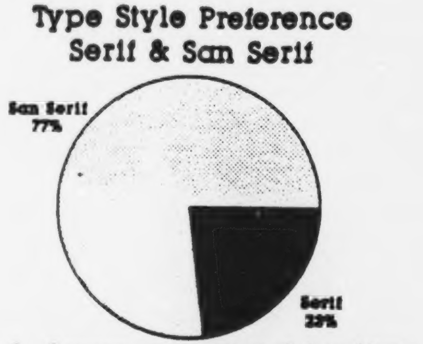

Figure 3. Seventy seven percent of the subjects prefered sans serif text over serif text.

Seventy seven percent of the subjects prefered the sans serif type over the serif type.

DISCUSSION

The findings of this study seem to reinforce Tinker's (1963) findings and Benson's (1985) conclusions that serif and sans serif text are equal for enhancing speed of reading comprehension.

The fact that these findings differ from Sonacki's (1988) and Robinson's et al. (1971) research is not too troublesome. Both studies were attempting to measure reading comprehension of a single character within a particular font. While this research is valuable it does not fully shed light on comprehension of continuous text.

Perhaps there are better research models for measuring reading comprehension than that used in this study. It is doubtful, though, that such measurements would reveal a significant difference.

It seems more prudent to turn our attention to the idea of reader preference.

The findings contradict Benson's (1985), Robinson's (1971), and Tinker's (1963) research which states that serif is generally preferred over sans serif. There are several possible explanations for this.

First, it is possible that preference is based on what we are used to. With the advent of the personal computer and a wide variety of easily accessible fonts it may be individuals are growing used to sans serif text. Second, when size of text is kept constant, between serif and sans serif, serif looks smaller because the serifs themselves push the letter structure closer to the center of the letter. And lastly, the serifs may be causing noise or distraction which inhibits the reader's ability to scan the text.

Further Research

More needs to be known about reader preference for certain types of text. Most important is the idea of what characteristics sway preference and how can these characteristics guide the use of the font.

The time to adopt the idea of writing visually has come. Those involved in communication will have to begin to consider external textual structuring techniques if they wish to remain effective communicators. Font choice and design are only two factors amidst a host of others but are no less important than any. Continued research on the details of visual writing leaves a promise for effective learning materials in the very near future.

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The Effects of Spatial Ability on Learning from Diagrams and Text

Merton E. Thompson

Background

The concept of designing and delivering instruction based upon the individual needs of students has been much discussed throughout the history of education. In reality, however, instruction has been designed around group norms rather than individual needs of the students. This has required the students to adapt their learning styles to the instruction in order to succeed within the system. Those whose learning style most closely matched the instructional method being used or those most able to adapt to the instructional method were most likely able to advance within the system. Those less able to make use of what the system offered often were less successful sometimes withdrawing mentally or physically.

In 1911 Edward Thorndike called for breaking away from this uniformity and designing instruction suited to the needs of the individual. This concept was extended by Carleton Washburne (1925) who wrote

> Throughout the educational world there has therefore awakened the desire to find some way of adapting schools to the differing individuals who attend them. (p. x)

This concept of designing instruction with the specific characteristics of the individual learner in mind was again addressed by Snow and Salomon in 1968. They stated that

> if the variables used to stratify the group are well chosen, then at least the stage has been set for a new kind of instructional improvement, one based on the hypothesis that there is no "one best way" to teach anything (p. 343).

In 1980 this concept was forwarded again, this time by Fantini.

> Attempts to find one method that would reach 100 percent is fruitless... The point is that we are now at a stage theoretically and practically in which we should be able to generate the capacity to tailor programs to fit individuals. No one method can be considered superior to the other except as it contributes to the learning of the individual (p. 28, 30).

Despite the fact that we now find ourselves in the 1990's and have moved from the "industrial age" to the "information age," little real progress has been made in designing and implementing instruction on an individual basis. This century has seen a continuing call for addressing the needs of the individual in education. The last several decades have also produced a string of educational innovations, but in retrospect the majority of these have been innovations in which a particular method was proposed and implemented because it was thought to be beneficial to all students. Much has been written and discussed indicating how Method A compares to Method B. But in the end most of these methods continue to work within the idea of group norms and not individual needs.

One possible contributing factor to this situation is that despite the fact that individual differences have been recognized and documented for a long time, very little is known about how these differences relate to the learning process. This study was designed to help build a body of information that would extend the information concerning individual difference variables to the educational environment. The specific individual difference variables chosen are two aspects of visual imagery referred to as spatial orientation and spatial visualization.

Visual imagery was first investigated by Sir Francis Galton in the early 1880's. Since that time this broad area has been divided into several categories. One area is often referred to as "human spatial ability." Sherman (1967) defined this as the ability to visually manipulate images without verbal mediation. In 1978 McGee wrote that "numerous factor analytical studies have yielded a spatial factor mathematically distinct from verbal ability." Further factor analytic research has consistently revealed two human spatial ability factors, spatial orientation and spatial visualization.

Spatial orientation is defined as the ability to perceive an object as a whole while its orientation is manipulated mentally. By comparison spatial visualization is defined as mentally manipulating one or more of the components within the whole object (McGee, 1978). Previous studies of these variables have shown a correlation of .60 with achievements in industrial arts courses, while correlating only .07 with verbal intelligence (Paterson, 1930).

Specifically, the purpose of this study was to determine if this relationship between spatial ability and achievement in industrial arts can be extended into other subject areas based upon mode of presentation of information. The hypotheses are:
(1) The text version and the diagram version will be equivalent overall in the presentation of information.
(2) Participants scoring in the upper third on the Cubes Comparison Test high will better be able to process information presented in diagram form.
(3) Participants scoring in the lower third on the Cubes Comparison Test will better be able to process information presented in text form.
(4) Participants scoring in the upper third on the Surface Development Test high will better be able to process information presented in diagram form.
(3) Participants scoring in the lower third on the Surface Development Test will better be able to process information presented in text form.

Methodology

The participants in this study consisted of 64 undergraduate college students enrolled at St.Cloud State University during the fall quarter, 1990. The age range of the students was 20 to 39. Each participant was classified on the spatial orientation and spatial visualization variables using the Cubes Comparison Test and the Surface Development Test respectively. Following this participants were randomly assigned to one of two groups. One group received a text passage describing the cyclical nature of biochemical schemes of the earth, the second group received a diagram of the same information. The diagram was adapted from one used by Holliday (1975, 1976). The text passage was adapted from one used by Branch (1989). The degree of equivalency of the information contained in the instruments was validated by a panel of four experts who have taught in the field of Earth Science (Branch, 1989).

Each group was allowed to study the material for ten minutes and then administered a comprehensive test of twenty-four multiple choice questions on the content. The comprehensive test was also adapted from Branch (1989).

The three independent variables were (1) spatial orientation, the score on the Cubes Comparison Test, (2) spatial visualization, the score on the Surface Development Test, and (3) presentation type, text or diagram. The dependent variable was the score on the comprehensive test. The upper third and lower third of the scores on the Cubes Comparison and Surface Development Tests. A two-way Analysis of Variance (ANOVA) was used to determine statistical significance of the study.

		Type of Presentation	
		Text	Diagram
Cubes Comparison Test	Upper Third		
	Lower Third		

2 x 2 Factorial Design

Figure 1

		Type of Presentation	
		Text	Diagram
Surface Development Test	Upper Third		
	Lower Third		

2 x 2 Factorial Design

Figure 2

Results

The results of the study indicate that there was no differential advantage between the presentation type. The mean score for the two versions was almost identical.

	n	mean
Text	31	16.55
Diagram	33	16.39

Table 1

The results also indicate that there was no interaction between either spatial ability test and the presentation type. As a result, the first hypothesis is supported by this study. The remaining hypothesis linking spatial ability to the presentation type cannot by supported.

Conclusions

In this study there was no indication of a relationship between spatial ability as determined by the Cubes Comparison and the Surface Development Tests and the presentation of information via text as compared to a diagram. If there is a relationship between individual differences and presentation type more information needs to be collected and assessed.

The results seem to indicate that diagrams are as appropriate for the presentation of cyclical information as text. Since all participants were given ten minutes, data was not collected relating to the overall efficiency of the text version as compared to the diagram. More information concerning this aspect also needs to be gathered.

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The Visual Business Presentation: An International Comparison

Robert E. Griffin

Introduction

The term "international business" is a common one used today in the world of commerce. It is heavily used because businesses are pursuing overseas customers and entering partnerships with international firms in unprecedented numbers. As a result, colleges of business are scrambling to internationalize their curriculums. Today's business students are studying languages, enrolling in business classes abroad and paying close attention to cultures other than their own. Why has the emphasis on international business grown?

Businesses today are no longer tied to particular countries. Firms are no longer viewed, for example, as U.S. businesses or British businesses. Even small businesses are no longer limited by country boundaries or cultural barriers. The reason for this expansion is new customers and now markets. Businesses have uncovered growth opportunities in non-traditional world markets and are hoping to capitalize on them. Successful businesses are those that recognize that their current marketplace is the world.

The purpose of the paper is to explore one aspect of international business communication. Specifically to report on how visualization is being used by business people as an aide to oral communication in the international setting.

Background

During the Summer of 1990 I was invited by The United States Agency for International Development (USAID) to teach a combined oral, visual and writing course. The course was for the Executive Master of Business Administration (EMBA) program at the University of the West Indies in Kingston, Jamaica. The Jamaican course was modeled after a course that I was teaching at Penn State University. The Jamaican class consisted entirely of students who were sponsored by their employers. Sponsorship was a requirement of the program and all students had to be employed full time by their sponsoring companies. Students in the two year program maintained full time employment and attended MBA classes from 8:00 A.M. to 5:00 P.M. on Friday and Saturday for eleven months of the year. A limited profile of the class is shown in Figure 1.

- Number of subjects = 27
  - males = 14
  - females = 13
- Average age = 40
- Average # presentations per year = 11
- Average length of presentation = 15 min.

Figure 1 - Jamaican Profile

Communication can be considered the common denominator of all functions in business. No matter what culture, business people must communicate information in order to move a business forward. My challenge in the University of the West Indies program was:

1. *to determine the existing international norms for the basic business presentation (this information had previously been gathered by the author),*
2. *to assess Jamaican business people to determine how communication was being used in business,*
3. *to design a program of instruction that addressed the differences between points 1 and 2.*

The differences that I found in the use of visual communication between the Jamaican subjects and their international counterparts became the focus of this paper.

Purpose of the Study

The study was conceived to determine how communication was being conducted in the Jamaican business environment. It was hoped that once an assessment was made determining the characteristics of the typical Jamaican business presentation, this data could be compared to existing data showing the characteristics of other international presentations. The differences would determine if there was a visual deficiency in the Jamaican presentations. A program could then be designed to train Jamaican business people.

How the Study Was Conducted

Data about existing international norms, has been collected at the Pennsylvania State University for the past five years from participants in the Penn State Executive Management Program (EMP). During the period of data collection participants in the EMP have represented a broad range of management levels. Their characteristics are shown in Figure 2.

- Number of subjects = 141
  - males = 128
  - females = 13
- Average age = 40
- Average # presentations per year = 13
- Average length of presentation = 30 min.

Figure 2 - World Profile

Data gathered from the Penn State EMP program was used as a normative data for this report. It was assumed that the data collected from the 141 subjects was normal and not skewed in any way. This data is referred to throughout the remainder of the study as "World Data".

The Jamaican data was gathered from the first Executive Master of Business Administration Program at the University of the West Indies. The 28 participants in the program represented middle and upper management in Jamaica. Research data was gathered by distributing the survey instrument to the class participants.

Analysis of the Data

The data collected from the Jamaican business people showed many clear differences when compared to the world data. Analysis indicated that presentations given by Jamaican business people differ from those in the world community. Let us examine the areas where there are major differences in the comparison of world to Jamaican data.

The most significant variance in the data was shown in the area of the use of visual aids in oral business presentations. Jamaicans report using far fewer visuals than their world counterparts. Fifty-four percent of the Jamaican respondents reported never or rarely using visuals in their presentations. This data is shown in Figure 3.

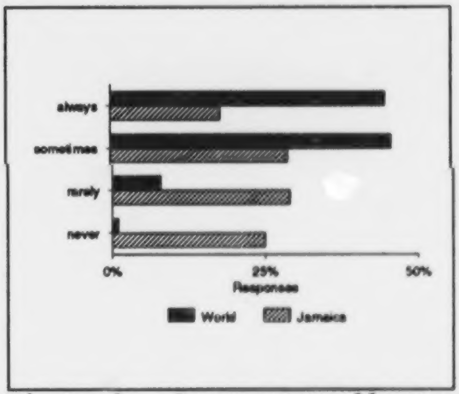


Figure 3 - Do you normally use visuals in your presentations?

An additional finding was that basic, unsophisticated audio visual display devices play an important role in Jamaican business presentations. Jamaican data showed that the most often used display technologies were flip charts (25%) and overhead projectors (25%). Other, more advanced technologies, were rarely used on the island. This data is shown in Figure 4.

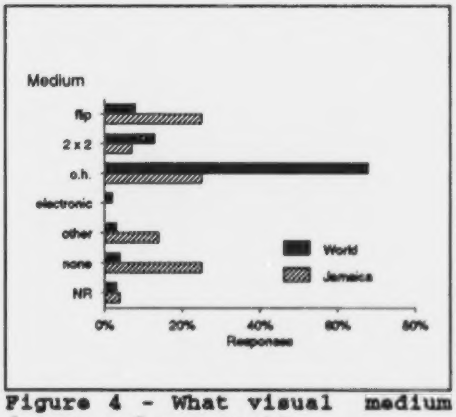


Figure 4 - What visual medium do you rely on most?

Another finding is that the Jamaicans rely less heavily on their staff to produce visuals for them than do their world colleagues. Jamaicans report that if they use visuals (30% do not) 37% of them prepare them themselves. This data is shown in Figure 5.

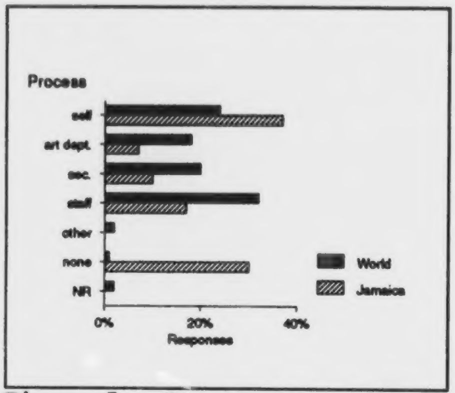


Figure 5 - How are your visuals prepared?

Jamaican business people also report they spend far less time working with computer graphics software packages than their world business counterparts. Their self made visuals are done in a less sophisticated mode than their world colleagues use. Over 50% of the Jamaicans do not use computer generated business graphics. This data is shown in Figure 6.

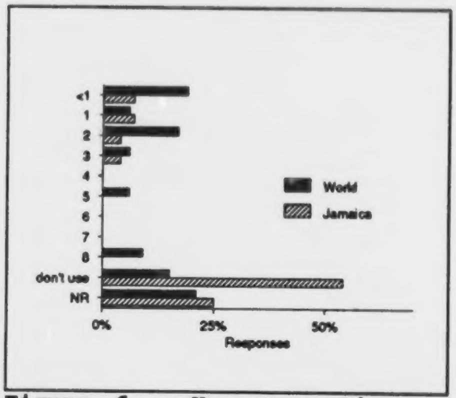


Figure 6 - How many times a month do you use a graphics software package?

When questioned on the topic of computer use, the Jamaican respondents answered that they did not always have immediate access to personal computers. Even if access was possible many of them had little or no knowledge about the use of computer graphics software. Lotus 1-2-3, which most business people would consider a spreadsheet or accounting program, was the most used business graphics program among the Jamaican business people. This data is shown in Figure 7.

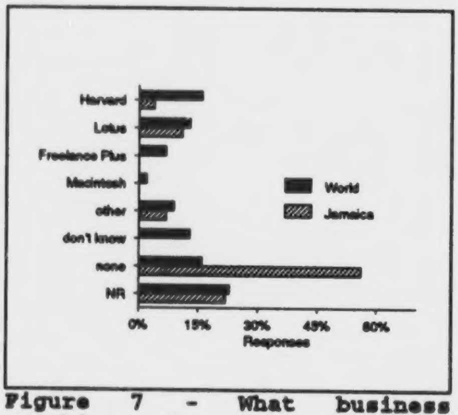


Figure 7 - What business graphics software do you use?

Implications of the Data

There are many conclusions that can be derived from this study. Several portions of this study have direct ties to the subject of visual literacy. These results are not hard, research based conclusions, rather they are observations that result from looking at the findings and deriving logical implications.

The implications are based on the assumption that a standard for business presentations is being established internationally. This standard is being set primarily by U.S., Japanese and European business people. Their presentation norms are the standard by which all business presentations are currently being measured.

These implications are:

Implication 1: Jamaican business people possess fewer visual communication tools and skills than their world counterparts. When we see that Jamaicans: 1.) do not use visuals in presentations, 2.) spend very little time on computers using computer graphics, and 3.) rely on less sophisticated audio visual devices, we can say they are unsophisticated in the use of visual presentations. This lack of sophistication appears to come from a serious lack of education concerning how to prepare the presentation, as well as a lack of role models to compare presentations against.

Implication 2: Jamaican business presentations deviate from world norms on virtually every measure. When comparing Jamaican to world measures, it is clear that the Jamaican presentation does not match the world standard. Major deviations appear in the areas of: 1.) use of visuals in presentations, 2.) medium used, and 3.) visual preparation.

Implication 3: Jamaica business suffers in part because of a lack of sophistication in visual business presentations. Because Jamaican business people must compete in world markets, they must strive to reach world standards in visual communication. When marketing, accounting or financial presentations are made by Jamaica business people in world capitals, their requests will be weighed partially on the basis of their presentation skills. Jamaicans must improve their communication skills.

Conclusion

As visual professionals we look across our home landscape and worry about our ability to make people visually literate. However, when we stand back and look across another landscape we see that we have been doing a better job than we thought and that we need to give others the benefit of the information that we have learned. My Jamaican experience produced that kind of view. In the United States we have struggled and grappled with visual communication since the 1930's. We know we have made progress since that time but, we have never known how much progress. When we compare our methods of visual communication with that of the Jamaicans we can get a snapshot of our progress. Our task now is not to lie back and comment on our achievement but, to teach others what we have learned. We have a responsibility to train others, like the Jamaicans, how to compete in the world marketplace so they too can participate on an equal basis.

Replication of Hoyt Sherman's "Drawing by Seeing" Using Modern Media

Donna Emsel Schill

A reasonable definition for human beings may be paradoxical creatures with a predisposition for creating dichotomies or, at the very least, creatures who can live with paradoxes. This research study is both paradoxical and dichotomous. The paradox is teaching a primal human skill using the oldest surviving media, (charcoal and chalk), with methods incorporating modern media, (computer generated and electronically projected images), and showing the relevance of an ancient skill in the technological world. The dichotomy is found in the way humans make sense of their world, often labeled as "the two ways of knowing". Educators, philosophers, epistemologists, cognitive psychologists, and computer scientists espouse this dichotomy with different labels: visual or verbal, tacit or explicit, simultaneous or sequential, right-brain or left-brain, analog or digital, intuitive or intellectual, revelation or reason.

Not only scientists, but artists too, have long sought answers for how we perceive our world and how we create statements about it. Making pictures is a uniquely human way of perceiving and communicating about the world (Arnheim, 1986).

One of the oldest, if not the oldest, creative acts is drawing, and among the oldest surviving media are charcoal and chalk substances (Breuill 1952; Marschack,1972, 1975). I have heard beginning art students comment on how much they appreciate 'primitive' cave art when they recognize 15,000 year old solutions to the cognitive problems they have encountered in learning to draw. They saw how overlapping was a way of describing depth relationships, how a clean, sharp line moves forward, while an indistinct, fuzzy line recedes, and how movement was represented in multiple images. Modern media / technology now provide us with the means to produce pictures easily. Other than for recreation, what need is there to learn to draw using old media?

As an artist I am advocating that people interested in computer graphics, whether they are engineers, architects, artists or graphic designers, should know how to draw with the simplest of tools from direct observation of the world. Teachers should also understand what is involved in the graphic and electronic creation of images. I do not believe this is a frivolous concern. We need to understand "visual thinking" and also how our use of tools / technology affects our mental processes and our concepts of knowledge.

Isn't it a bit farfetched to think research concerned with "just drawing pictures" can have any bearing upon the problems facing our technological society? I would answer that what appears as a simple human action seldom is simple, and that understanding simple human actions can lead to far-reaching solutions.

One paradox is this current study examined a technique to teach drawing that was developed in the 1940s. It was based on the research of Hoyt Sherman at The Ohio State University and resulted in the book *Drawing-by-Seeing* (Sherman, 1947).

Sherman (1947) reported that the methodology of a flashing image in the beginning sequence of teaching students to draw significantly increased the ability of these students to draw three dimensional natural subjects when they were presented with standard art school drawing tasks. More controversial were the reported gains in the students' visual acuity.

Research Hypotheses

The two hypotheses investigated were drawn from Sherman's work:

1. The pictorial organization in pictures drawn by subjects taught using the *Drawing by Seeing* methodology will be better than the pictorial organization of subjects taught by traditional methods.
2. Subjects taught to draw using Sherman's *Drawing by Seeing* methodology will score higher in visual acuity than subjects taught by traditional methods.

In addition to these hypotheses a number of less quantifiable questions were addressed.

Research Questions

1. Did the confidence subjects had in their ability to draw before instruction have any relationship to the ratings of their final drawings?
2. Did previous art training effect the ratings of their drawings?
3. How did subjects remember the projected image? What role did their 'memory' play?
4. What strategies did subjects employ to remember projected images of increasing complexity ?
5. Did subjects attend to an afterimage? Did subjects develop drawing strategies that used an afterimage?

Design of Study

Sherman's design used a pre-post test with a control group to measure changes in visual acuity. Sherman reported that there was an increase in subjects' visual acuity as a result of the drawing-by-seeing training. Sherman himself admitted that this was controversial:

> The gains in central and peripheral acuity are of particular interest because of a common assumption in the literature on the subject that central acuity can be little affected by training of any kind, and peripheral acuity only a little more. These data challenge further investigation of this common assumption. (Sherman 1947, p. 45)

This study differed from Sherman's work in four basic ways:

1. A visual abilities measurement and survey was given before instruction.
2. There were control groups composed of students from other beginning drawing classes.
3. Visual journals were kept by the subjects throughout the treatment and were used to evaluate the drawing strategies developed by the subjects.
4. Modern media were used for the production and projection of images.

These additional components of the study were expected to make it easier to interpret the results. The study's revised design had four sources of data:

(1) the entering abilities survey,

(2) visual acuity measures

(3) the individual drawings,

4) comments and observations in the visual journal sketchbooks.

Each of these sources of data used different techniques for analysis.

1. Entering abilities survey:

In the studies that did replicate Sherman's work (McWhinnie 1969, McDowell & McWhinnie 1970), although visual acuity was tested, none used measures of students' visual abilities before the treatment. In this study, all subjects took a test of visual ability before treatment. The pre-test instrument was designed by the investigator from items taken from other tests of visual abilities and visual problem solving, (Salomon,1977; McKim,1981) The visual abilities were

(1) visual memory—verbally recalling the items seen in a picture

(2) mental imagery—recalling word pairs by forming a mental image.

The visual problem solving involved mental rotation of objects, discerning embedded figures, and completing patterns, figures, and sequences.

A confidence survey measure was developed from work on everyday drawing tasks (Van Sommer,1984) and art school tasks. The everyday tasks were drawings done by non-artists to communicate visual information, such as drawing a map to help someone find their way. The confidence was measured on a Likert scale of seven from Very Confident to Not At All Confident.

2. Visual acuity measures:

A visual acuity test was selected after review of Sherman's tests and results. The most significant result, the measure of central acuity, is reliably measured with the Snellen fraction, a non-invasive and easily administered measure (Vision Journal, 1988). The instrument used for the visual testing was a Keystone stereoscopic instrument that had the capability of 14 different tests. The acuity test was composed of 21 circles filled with patterns of either squared dots or girded lines that were progressively more difficult to discern, or plain gray. The expected range for normal vision is within circles numbered 12 to 15. The same tests were used for both the pre-test and post-test for visual acuity.

3. Individual drawings:

The purpose of the training in the dark was not a product, but rather to establish a strong link between subjects' vision and their kinesthetic response. It was not necessary to keep any of the drawings produced in the dark. However, once the drawing sessions moved into natural light and the drawings were their own compositions, each subject was required to keep a portfolio of work.

4. Visual journal sketchbook:

Concurrent with the portfolio, each subject kept a visual journal of their reactions and observations. Time was allotted in class for writing and drawing in the visual journals.

Methodology

Solomon Four Group Design (Figure 1) was the design for this study. (Kerlinger 1964, p. 312)

GROUP I	A pretest	treatment	B postest
GROUP 2		treatment	C postest
GROUP 3	B pretest		D postest
GROUP 4			E postest

Figure 1 SOLOMON FOUR GROUP DESIGN

Groups I and II are the treatment groups, while groups III and IV are the control groups. All four groups were composed of students who had enrolled in different sections of the same level beginning drawing course. The difference between sections was whether or not they were art majors. The treatment groups were composed of students enrolled in the one section designated for non-art majors and randomly assigned to Groups I and II. The control groups were composed of students enrolled in two different sections for art majors and randomly assigned to Groups III and IV.

Production of Images

The images were computer generated on a Macintosh II using the object-oriented level in SuperPaint and followed Sherman's design sequence. The computer images were printed on a Laser Printer. The printed images were then photographed with 35mm. camera macro lens on a copy stand using ASA 100 film. All in all, 250 slides of abstract images were produced using a variety of media.The slides for the master work sequence were either photographed .

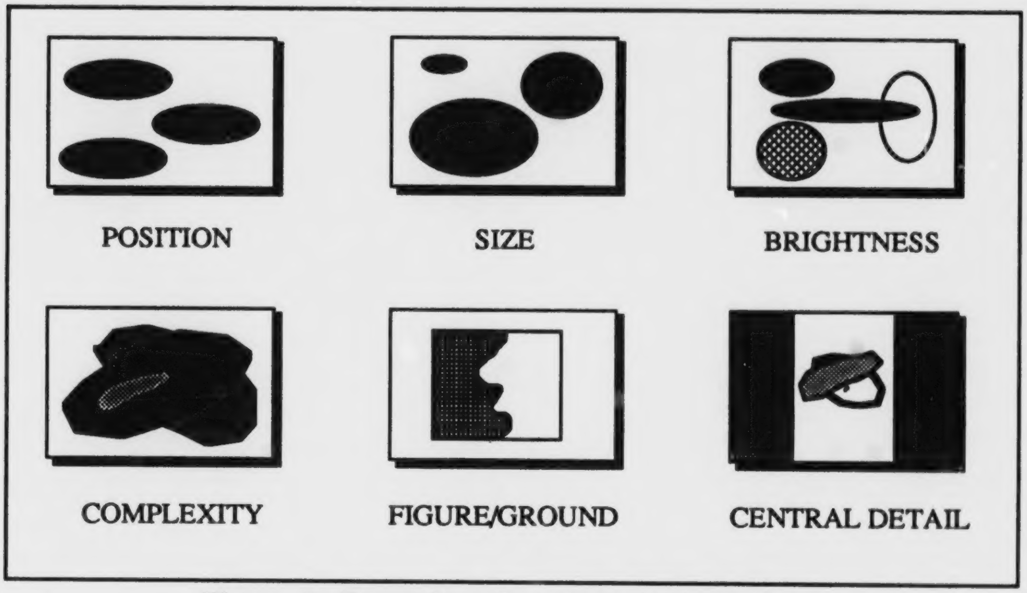


Figure 2: Examples of abstract design slides.

from art texts or were obtainedfrom the Art School slide library and Inter-library loan from The Ohio State University.

The slides were flashed on the screen with a carousel projector which had 2 X 2 blank inserts before and after each projected image. The quickest flashing was achieved by starting the projector in forward motion with a blank slide and then not releasing the control until the image had been shown and the projector had proceeded to the following blank. This created a viewing time of less than 1/10 of a second, but more than 1/20 of a second.

Examples of the abstract shapes that became progressively more complicated through the first four weeks are shown in Figure 2. The same ovoid shapes were shown the first session, the only change was in their position. The second session added a change in size, the third added value changes and so on. Each session began with a brief review of preceding slides.

After each drawing session, subjects were given the opportunity to write in their visual journals. The instructions were open-ended. The subjects were to write about anything they thought interesting, unusual, or insightful about their progress in learning to draw. At the end of the quarter, their complete journal entries were recorded verbatim using a computer word processing program (Word 4. on the MacIntosh). The journals also included many sketches that were photocopied but not recorded into any computer program.

Portfolio work included all the drawings done from the fourth week to the end of the quarter.

Figure 3 condenses the sequence of activities, along with the prerequisite conditions, in the ten week quarter. The progressive design of the images is planned to focus the reaction in terms of the specific mental operations required. (Salomon 1984). As an example, in the fourth week the image of a master drawing was first quickly projected as a blurred image. Subjects were to quickly draw dark and light forms over the entire format. A focused image of the same subject was then shown. Subjects were to draw the details they could now observe over the dark and light forms of the preliminary format. The sequence of the projected images modeled processes an artist might use in composing

Sequence of Activities	Prerequisite Conditions
1st: Abstract, simple shapes: slides	View < 1/10 sec. total darkness. Time limit. Music
2nd: Abstract, complex shapes: slides	View < 1/10 sec. in total darkness. Review work after darkness. Music.
3rd: Abstract, detailed center: slides. Master drawing series begin.	View < 1/10 sec. in total darkness. Slide viewed twice. . Music.
4th: Master artist drawings: slides. Artists: Rembrandt, Vermeer, Wyeth & Sherman	View < 1/10 sec. blurred, then focused image. Draw in light, not look at work until sequence completed.
5th: Moving figure: 16 mm. 'Pas de Deux' (McLaren film of dancers in stop action)	Sequenced stop action lightning. Draw in light. Look at work. Music.
6th: 3 dimensional objects, suspended. Ambiguous settings.	Flash of light. Draw in light Unlimited time. Music optional.
7th: 3 dimensional objects, actual views.	Draw in natural light, unlimited time.
8th: Human figure (statues), actual views.	Combined light sources, natural and artificial. Optional music.
9th: Self portraits from life, not from another picture or photo.	Individual choices.Fantasy pictures.
10th: Outdoor landscapes in color.	Limited palette. Unlimited time.

Figure 3: Planned progression of drawing activities.

an image:: "squinting" at an image to blur the details, and after the overall dark and light pattern was drawn, adding the detailed, focused image.

Results

Drawings from both the treatment and control groups were evaluated at the end of the quarter. It was the first time the subjects had been identified for the instructors. They were asked to choose drawings from those subjects to be used in the evaluation session. Both treatment and control subjects' drawings were chosen during their individual critiques that take place with their instructors during the final week of the quarter.

Four professors who have all taught beginning drawing, but were not teaching it currently, were members of the rating panel. Kerlinger (1964) states that aesthetic objects, like pictures or abstract drawings, can be sorted according to strength of preference. The procedure for the forced Q-sort is to construct a distribution from the extreme ends, with the best and least successful rankings assigned first, until a neutral mode is left.

For 47 items the forced distribution is 3, 5, 9, 13, 9, 5, 3. (See Table 1)

As ranks are assigned to items (drawings) those are removed from view. Finally, in the middle of the distribution are the neutral items (or "gray drawings" in art school vernacular). These drawings solicited neither a positive nor a negative reaction and form the mode. The middle value of each forced sorting was assigned as the score to every item in that category.: The three best each received a value of 46, the next five best each received a value of 42 and so on with the three least successful receiving a value of two (2).

Table 1: Values of Forced Q-Sort of 47 Drawings

LEAST			NEUTRAL			MOST
			30			
			29			
		17	28	31		
		16	27	32		
	8	15	26	33	40	
3	7	14	25	34	41	45
2	**6**	**13**	**24**	**35**	**42**	**46**
1	5	12	23	36	43	47
	4	11	22	37	44	
		10	21	38		
		9	20	39		
			19			
			18			

There were two aspects of the results of this experiment:

(1) the testing of the formal hypotheses

2) a narrative description of the less quantifiable aspects of the study.

The hypotheses testing is detailed first. Second is a discussion of confidence measures and results, followed by comments about the treatment within context, strategies the subjects employed in dealing with the treatment tasks, relationships between changes in visual acuity measures and personal comments.

Data were analyzed using Kruskal-Wallace for the Q-sort (Hypothesis 1) and t-tests for visual acuity (Hypothesis 2).

Hypothesis 1

To test for agreement among the raters W (Coefficient of Concordance) was computed. The result of this computation was a W equal to .296, which with 4 judges and 47 cases had a probability of occurring by chance of less than five percent. Given this significant agreement among the judges the mean rank for each subject's drawing was used to assign rank order for the computation of K. The subject with the lowest mean value was assigned the rank of one (1). The subject with the highest mean value was assigned the rank of 47.

The first hypothesis of this study, "The pictorial organization in pictures drawn by Subjects taught using the *Drawing by Seeing* methodology will be better than the pictorial organization of subjects taught by traditional methods" was tested by computing K (Kruskal / Wallace one way analysis of rank data). The resultant K was equal to 2.82, which with two groups and 47 cases had a probability of occurring by chance more than 10 percent of the time. Thus the research hypothesis is not accepted. Furthermore the mean rank for the treatment groups (20.57) was lower than the mean rank for the control group (27.29) which was opposite from the expected direction.

Hypothesis 2

The second hypothesis was "Subjects taught to draw using the *Drawing by Seeing* methodology will score higher on the Snellen test of visual acuity than subjects taught by traditional methods." Table 2 presents a summary of vision measures by group for each eye.

To test for the change of measured vision within the groups of Solomon Four Group Design (Fig. 1) t-tests were calculated.

Treatment Control Pre-tests: (cells A & B)

Right Eye t= .89 df=21 p=.38
Left Eye t =-2.55 df=21 p=.02

No significant difference was evident in right eye measurement between treatment and control, but there was significant difference in the left eye measure with the control group scoring higher.

To test for significance in the change of measured vision in the right and left eye of the treatment and control groups with pre and post tests a correlated Students 't' was calculated. The resultant 't' for the right eye of the control group was t=3.88, with ten

TABLE 2: Summary Statistics for Vision

	Right Eye			Left Eye		
Test	N	Mean	Std. Dev	N	Mean	Std. Dev.
Group I: Treatment						
PRE TEST	12	11.33	3.96	12	9.00	3.59
POST TEST	12	15.38	2.05	12	15.17	4.49
Group III: Control						
PRE TEST	11	12.73	3.52	11	12.36	2.69
POST TEST	11	16.55	3.53	11	17.55	3.01
Group II: Treatment						
POST TEST	11	16.27	2.69	11	15.73	2.97
Group IV: Control						
POST TEST	13	15.00	2.67	12	14.92	2.50
COMBINED GROUPS						
Groups I & II: Treatment						
POST TEST	23	16.04	2.62	23	15.43	3.75
Groups III & IV: Control						
POST TEST	24	15.70	3.11	23	16.17	3.01
Total: Groups I, II, III & IV						
PRE TEST	23	12.00	3.742	23	10.61	3.564
POST TEST	47	15.07	2.856	46	15.80	3.384

degrees of freedom, this had a probability of occurring by chance of less than 5 percent. The similar test for the left eye of the control group was t= 2.46, with the same degrees of freedom which also had a probability of chance occurrence of less than 5 percent. The experimental group's change in visual acuity measure was tested in the same manner with similar results. The right eye 't' = 3.46, with 11 degrees of freedom, would have occurred by chance less than 5 percent of the time.

The left eye results for the experimental group was 't' = 2.97, with 11 degrees of freedom had a probability of occurring by chance of less than 5 percent. Given the values of 't' for both measures of visual acuity across both groups it was concluded that there were real changes in measured visual acuity for both groups.

Total Pre-test—Post-Test :(cells A. B & C. D. E. F)

Right Eye: t=5.43 df=68 p<.001
Left Eye : t=6.75 df=67 p<.001

There seems to be no question that there was a significant improvement in both eyes between pre-post tests across both the treatment and control groups.

Treatment—Control: (cells C. D and E. F)

Right Eye : t=.40 df=45 p=.69
Left Eye t=-.74 df=44 p=.47

There was no difference between the Treatment and Control groups. On the basis of these analyses the second hypothesis was not accepted. In summary, there was not evidence to accept either directional hypothesis in this study.

The narrative data from the journals help to interpret these statistical results.

Research Questions

All subjects took a survey of their entering abilities on visual tasks and their confidence in performing different types of drawing tasks. The visual tasks were a.) imagery: using an image to remember word pairs and b.) memory: visual memory of items in a picture.

The confidence in art tasks combined the responses to drawing an individual's portrait, a particular breed of dog, detailed instructions of a physical sequence and an imaginary Martian. The confidence everyday tasks combined the responses to drawing a map to the nearest library, a floor plan of a childhood home, an animal a three year old would recognize as a dog, and restroom symbols.

Analyses of the data on confidence in everyday art tasks resulted in a t of .55 which with 45 degrees of freedom had a probability of occuring by chance 59 percent of the time. For the art tasks the results were similar, with a t value of .81 and again with 45 degrees of freedom has a probability of .42. Thus it can be concluded there was no difference in students confidence level upon entry into drawing classes.

Testing for Memory: Independent samples of Treatment and Control groups

t= -.25 df=45 p.=.80

Testing for imagery: Independent samples of Treatment and Control groups

t=.44 df=45 p.= .66

Analyses of the results of a.) imagery and b.) memory showed no significant difference between the treatment and control groups.

In the preliminary survey, the subjects were asked what art classes they had before this beginning drawing class. Their responses were condensed into three categories: (1) none, (2) 7th through 12th grade. (3) post-secondary (See Table 4)

These data were analyzed via chi square. The resulting chi-square of 10.40 with df=2 has a probability of occuring by chance less than 1 percent of the time (See Table 4). There is a significant difference in the level of prior art classes taken between the treatment and control groups.

The cell, control group with post secondary art classes, had the highest frequency of observations with 13. The cell, treatment group with no prior art classes, had an observed frequency of 8. The control group had a significantly higher level of post secondary art classes.

In summary, the students began drawing instruction with no significant differences in their visual abilities or confidence . However, the control group had a significantly more post secondary art training than did the treatment group.

Table 4:
Level of Prior Training by Treatment and Control Groups

	Treatment	Control	
No art beyond 6 gr.	*E = 4.5 *O = 8	E = 4.5 O = 1	9
7–12th grade	E = 10 O = 11	E = 10 O = 9	20
post-secondary	E = 8.5 O =4	E = 8.5 O =13	17
E=expected O=observed	23	23	46

χ^2 (2, N = 46) = 10.40, p <.01

Journal Sketchbooks

The data for the first two research questions were compiled from the entering survey and visual abilities test. However, the visual journals were the resource for the answers to the research questions posed in the beginning of this article. This article will concentrate on those dealing with memory and imagery.

There was a broad range of formats used for the visual journals. Not all subjects dated their entries. One journal had no verbal entries, only sketches, and was not used in the analysis. Seven categories were color coded and tabulated for the 22 subjects. Subjects wrote about a single category numerous times.

(1) mention of an afterimage,
(2) development of methodology,
(3) kinesthetic reactions or strategies,
(4) personal feelings or frustrations,
(5) reactions to music,
(6) symbolic memory tasks,
(7) reactions to darkness.

The afterimage category had two tabulations. The first was whether or not an afterimage phenomenon was mentioned (the number of times) and the second was whether or not the subjects wrote that they used the image as a drawing aid. Three subjects did not mention an afterimage phenomenon. 19 subjects noted an afterimage effect and 13 of these wrote they used the afterimage to help in their drawing.

Discussion

Hypothesis 1

The Sherman methodology did result in subjects acquiring the skill of drawing. We do know that the control groups, composed of art majors, began instruction with significantly more post-secondary art classes than the treatment groups who had little, if any, art training (See Table 4). This can be interpreted to mean that control subjects had an initial advantage presupposing the likelihood of superior performance compared to the treatment groups. The fact that there was no significant difference in the drawing ratings between the treatment and control groups at the end of the instructional methodologies indicates that the treatment groups did draw "as well as" the control groups composed of art majors. Competent drawing by beginning students is corroborated by other drawing methodologies (Edwards, 1986; Hoffman, 1989).

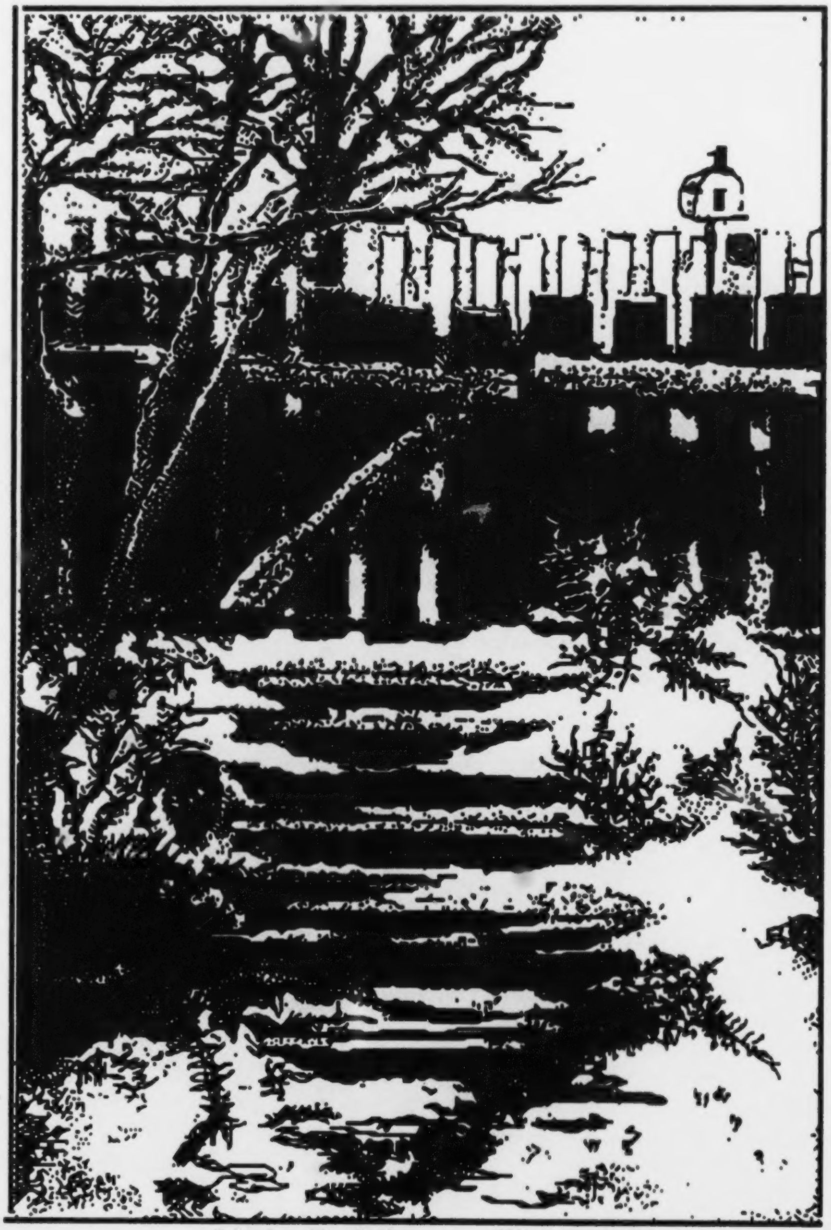
The treatment group had 8 students who had no art training beyond elementary school while the control group had 13 students who had post secondary training. More telling is the fact that these eight university student have progressed so far in our educational system without any stated experience about the "visual way of knowing".

The skill of drawing was once part of a classic education because the understanding of images was considered fundamental. To not understand images is to be vulnerable to manipulation by people who do understand how images influence meaning. Another important, and appealing, aspect in Sherman's drawing methodology is that there are no verbal instructions about the act of drawing nor about classic problems in artistic composition. His methodology relies upon individuals developing their own strategies. A mediating authority giving instructions is not necessary. The treatment groups did not receive verbal instruction about drawing techniques. The control groups did.

Individuals in the treatment groups developed their own strategies and methods with minimum guidance from the teacher. The most consistent verbal instruction was "Draw what you see". Comments in the visual journals reveal the diversity of styles that developed from individual techniques. The development of individual style should be the ultimate goal of an artist, and therefore, of any drawing methodology.

> One of the characteristics of great drawings is the artist's whole-hearted acceptance of his own style and character, It is as if the drawing says for the artist, 'here I am'. (Goldstein, 1973)

> Because the exercises focus on expanding your perceptual powers, your individual style - your unique and valuable manner of drawing - will emerge intact. As your skills in seeing increase, your ability to draw what you see will increase, and you will observe your style forming. Guard it, nurture it, cherish it, for your style expresses you. As with the Zen master-archer, the target is yourself. (Edwards,1986)



Linda Christianson, Winter 1990

This research continues its paradoxical nature. The two basic hypotheses were not accepted yet the results are encouraging and intriguing. The drawings were wonderful!

This is a computer scan of a charcoal study done the week the students began drawing in natural light. The student, who had no art instruction beyond elementary school, plans on becoming a teacher.

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> A training program in the arts which goes deep enough to establish fresh abilities in seeing is also likely to go deep enough to open up channels of ready action through out all of the student's behavior so that he has much more fluid power in expressing himself.
> (Sherman, 1947).

The investigator was told by one of the art professors who had participated in the ratings that, upon reflection, he thought the strength of the (treatment) methodology was the diversity of the individual styles that had been developed. His observation is corroborated by the comments in the subjects' journals. Development of individual styles was one of the categories tabulated from subjects journals.

I believe an important contribution of this study is that it made explicit the tacit expectation that learners will develop individual strategies. In instructional design theories, individual differences are acknowledged and accommodated. However, many instructional designs with standardized aims are a funneling process. The methodology in this study did not seek standardized outcomes but encouraged divergent creative efforts. It used modes of instruction that were consistent with the skill developed: a visual skill - drawing, was developed that used visual modes: projected images, drawings and natural objects.

Drawing-by-Seeing did accomplish a primary aim of any drawing program. The development of individual style is a specific contribution of Sherman's methodology.

Hypothesis 2

The visual acuity gain as a result of learning to draw was acknowledged by Sherman as being the controversial finding of his methodology. Visual acuity gain in learning to draw is not unique to Sherman's methodology.There was a significant visual acuity gain in both groups of this study.

Artists have often said that "learning to draw is learning to see". Will focusing and refocusing on different subject matter make a change in the muscles contracting the lens within the eye? That is doubtful. What else might be going on?

Visual acuity was tested using a chart which had patterned circles of progressively smaller lines or squared dots that appear as plain gray upon first glance. My supposition is that the gain in both the treatment and control groups can be attributed to the fact that the subjects were *attending to* what they see because they had been drawing. They are looking at the patterned circles *as if* they were going to have to draw them. What once was identified as plain gray is now seen as squared dots (or lines). In drawing classes subjects learn to give careful attention to relevant details and relationships and to discriminate. The everyday environment appears more replete. People in beginning drawing classes remark about how they "see everything differently now", "I notice more", "I now see things that were always there but I never noticed".

Gibson remarked about the sensitizing of a perceptual system.

> The state of a perceptual system is altered when it is attuned to information of a certain sort. The system has become sensitized. Differences are noticed that were previously not noticed. Features become distinctive that were formerly vague. (Gibson 1979, p. 255)

In the drawing methodology, the improvement is in the attention being given to the environment; looking at , and becoming more discriminating about objects (and people); noticing their actual shape, form, texture and color, and not looking in a perfunctory fashion. Does this improvement take place because there has been a consistent kinesthetic response to what has been seen? I conclude that is the case. A paradoxical interest in the work of Vygotsky (1978) and the work of Edelman (1987), led me to this point.

Edelman's theory of neuronal group selection, which explains the structure and function of the human brain, may give us a clue as to what is happening. He integrally links motor responses to perception and recognition in describing memory and the categorization of information.

> Neuronal groups are organized into sheets, called maps, and the interactions among the various maps---and the fact that all maps are connected to a motor output and to the initial sensory input--categorize information. The past is restructured in terms of the present. Perception and recognition, then, are part of the same unitary process. (Edelman, 1987, p.9)

Vygotsky's axman metaphor (Tikhomirov: 1974) also emphasizes motor activity and interaction with the environment , leading to a change in psychological and physical processes. The mediated tool use of pencil and charcoal, changed the neuronal networks (rather than the sinews) of the artist resulting in more discriminating perception, or recognition, of the environment (patterned circles).

The role of imagery is one of the continuing debates in the psychology of perception, which is bedeviled by the fact that there are no definitive concepts of what an image is. The subjects writing about their own processes are not necessarily concerned, nor cognizant, with the imagery debate. The nature of the research - teaching the skill of drawing - would strongly support the view that images are iconic, not propositional, in nature(see Pylyshyn-Kosslyn debate in Boden, 1988).

Concepts that these subjects expressed concerning memory are consistent with Ong (1982), and with Illich and Sanders (1989).

> Like words and text, memory is a child of the alphabet. Only after it had become possible to fix the flow of speech in phonetic transcription did the idea emerge that knowledge –information– could be held in the mind as in a store. Today, we take this idea so completely for granted that it is hard for us to reconstruct an age when recollection was not conceived as a trip into the cellar to pick up stores, or a look into a ledger to verify an entry. Since the fourth century B. C. , memory has been conceived as such a deposit that can be opened, searched, and used. Philosophers have disputed where this deposit is located ... but in all these discussions memory has remained a bin, a wax tablet, a book.(p. 15)

Illich's metaphor of memory as a bin, wax tablet or book, was extended by these students to include electronic and other media. The metaphor of mind as an entity with a surface remained.

> Images remain engraved on my mind for a few seconds longer.
>
> I am a xerox copier in the brink of my eyes.
>
> I found that as soon as the images disappeared from the screen, they remained imprinted in my vision for several seconds afterward. It felt almost as if I were 'cheating' ...what I'm supposed to be seeing for 1/10 of a second I'm actually being allowed to view (through my own body's wonderful technology) for a few seconds. Pretty amazing.

Strategies for drawing complex images used afterimages, whether or not they were referred to as such. Subjects wrote about 'memory' as an entity with which they interact:

> I almost feel I'm in a race with my memory - having to scurry down an image on paper before my memory goes out.
>
> I noticed that my mind made indelible images, like shadows, in my mind after the projected image was released from the screen.
>
> I'm carrying over an image from a previous slide to fill in the space (perhaps due to loss of memory) for the present slide.

Only five subjects of the 23 tabulated made no reference to how they remembered the projected image or indicated their reliance on memory. As the images became more complex, the subjects reported the reconstruction of the current image using the part of the previous image that occupied the same placement within the format.

This was an unexpected phenomenon that I shall call *the transportation of image parts*. 'Remembered' parts of images were 'brought over' to complete 'forgotten' parts of current images. Rather than think of memory 'products' in discrete units that can be manipulated, *the transportation of image parts* phenomenon may have another interpretation. It may demonstrate 'continuous' perception—the flowing, sweeping, and transforming retinal image that Gibson wrote about.

> The stimulus organization that underlies the visual world is independent of the anatomical loci stimulated and gives rise to the flowing, sweeping, and transforming retinal image. Gibson's distinction concerning the retinal basis of the two kinds of seeing: "the retina anatomically and momentarily considered [versus] the retinal image as an extended ordinal pattern. (Reed,1988, p 132)

Future Research

The responses to the images by the subjects in this study extend, rather than define, conclusions about the role of sensorimotor responses to the visual images. How do the motor responses of the drawing act influence the perception and memory of present and subsequent images? I believe the phenomenon of this study should be examined in the light of Edelman's Theory of Neuronal Group Selection or TNGS (Edelman, 1987).

The philosophical / psychological bases to questions of imagery and memory must be thoroughly articulated by any investigator. After such articulation, one of my first research questions would be whether the *transportation of image parts* would occur if the 'transported part' had only been viewed and not drawn.

The importance to this study is not how subjects reacted to or tolerated different, and concurrent, modes of stimuli on a given day but how subjects reacted to the total environment , through the concourse of kinesthetic, tactile, psychological, auditory, and optical sensations.

The reason for undertaking this replication of Sherman's work was his underlying philosophy.

> In the training course in drawing, the students can learn how it is that some of the most valuable things in life come, not by deciding what to do and doing it, but by relaxing the ego and letting things come out of the center of oneself as they will. They begin to marvel at the unknown things they have within them, and to respect what has been given them without their having done much to put it there. (Sherman, 1947, p.54)

Epilogue

The visual ways of knowing and imagery, have gained credibility within psychology, especially cognitive science. Humans are so good at picking up information visually it was not understood how complicated it is.

Although artists have been investigating visual phenomenon for centuries, in recent times it has been the computer vision and Artificial Intelligence scientists who have "opened our eyes" to the extraordinary abilities and requirements in visual perception. The results of their work have brought into question the dichotomies stated in the beginning of this article. Is the visual - verbal dichotomy itself an ill-advised view? I believe it is. We must counter dualistic thinking, especially in an epistemological context. Two seminal thinkers have stated their opposition to dualistic solutions in very forceful, and different manners:

> ...the relation between the scientific observer and his mind can no longer be sidestepped. Apart from the profound (and perennial) problems of the philosophy of mind ...scientific epistemology must confront the issue of consciousness in terms of evolution, development, brain structure, and the physical order as we know it. If that confrontation is to remain in the scientific domain, a dualistic solution or any form of Cartesian empiricism cannot be countenanced. (Edelman, 1989, p. 12)

In December 1974 Gibson wrote to Robert Shaw:

> Concepts versus percepts. There's the rub! Kant made them absolutely separate, and foisted on us a terrible theory about percepts being 'blind" without concepts (and concepts being 'empty" without percepts). Crap I say! *That's* what we have to reject. No line of demarcation separates percepts and concepts. We must rid ourselves of this distinction. (Reed,1988, p.299)

I.A. Richards (1974, p.92) in *Media and Symbols* quotes two poets who end this article with befitting imagery:

> Released from our fragmentary modes of living, which were the result of the industrial revolution, man could conceivably move into the world of mankindness. Well-informed sentience is the answer.
>
> God guard me from the thoughts men think
>
> In the mind alone;
>
> He that sings a lasting song
>
> Thinks in a marrow-bone.
> (W.B.Yeats)

or again

> Our society is moving into the world of unified sensory perception and away from two thousand years of fragmentation of the sense life.....The malaise is, in part, caused by a recognition, in most cases subliminal, that the old methods of organization, whether they be in business, in education, or in life generally, are no longer effective in a milieu where:
>
> It is impossible to say just what I mean!
>
> But as if a magic lantern threw the nerves
>
> in patterns on a screen.
>
> (T.S. Eliot)"

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Teachers' Perceptions of "Exploring Nepal," A Level III Interactive Videodisc Program: Reseach in Progress

Martha B. Grant

Research on teachers' interactions with complex new technologies sheds light on the important pedagogical and ontological concerns of the gatekeeper to technology use, the classroom teacher. In addition, research on teachers' perceptions of innovative media has implications for design and development issues for these media, has implications for the way these technologies should be introduced to teachers, and provides alternative utilization strategies to fit a variety of teacher characteristics.

Focusing beyond these expectations, there are those who believe that technology might contribute to the current movement to radically restructure education (Kerr, 1989). Urging more research on teachers' uses of and ideas about technology, Kerr laments the fact that from a teacher's perspective an overwhelming demand for the practical basic classroom maintenance reduces the amount of time and energy a teacher has to try new things. Thus, it is up to the educational technologist to facilitate the school reform movement by considering "...teachers' motivations and sources of reward in teaching and consider those in relation to what technology either provides or takes away," (p.12) designing technological tools which give teachers more control and modifiability, rather than 'teacher-proofing' materials. He concludes,

> Using technology to define and strengthen teachers' roles, to empower them in their institutional context, to allow them to find and amplify their voice, will lead to a truer and more effective linkage of teaching and technology, a linkage that can also contribute to important broader changes now under way in education (p.20).

On the other hand, voices of moderation are heard from educational technologists like Cohen (1987), who reminds us that enchantment with technology in education began in the early 1820's when school texts were the great novelty and that a common feature of technical innovations in education has been inflated hopes for their effects. Following this cautious line of thinking, historian Larry Cuban (1986) suggests that teachers' preference for books over radio, TV, and film was due to books' adaptability to individual differences in students. However, educational practices of teachers did not change and become more flexible to accommodate individual differences. Instead, teachers adapted the textbook to their existing instruction and classroom organization. The microcomputer offers the same flexibility, which advocates see as the primary attribute toward reform of traditional teaching, but which also makes it easy for traditional teachers to adapt this new technology to their purposes.

Wiske et al. (1988) reiterate the concept this way:

> In thinking about the effects of new technologies on teachers, it is important to recall the image of computer as Rorschach card (Amaral, 1983) onto which educators can project myriad purposes. The range of possible software allows the computer to serve as an educational tool for virtually any subject matter, any educational philosophy, any teaching approach. ...Given this variety, asking what effects computers have on teachers seems as broad as asking what effects books have on teachers. A clear message from this study is that the impact of computer technology on teachers cannot be considered narrowly but must acknowledge a wide range of technologies, teachers, and school contexts (p.42).

Research on teachers' interactions with a complex new technology informs this continuing debate among educational technologists about the reciprocal interplay of technology and teachers. This paper describes "Exploring Nepal," a Level III Interactive Videodisc program, and the methodology of research in progress which examines teachers' interactions with and perceptions of this program.

Description of "Exploring Nepal"

Begun in the summer of 1987 as a research and development project to explore the possibility of repurposing existing instructional television video for Interactive Video, the "Exploring Nepal" project has gone through several iterations in its movement from prototype to completed product. It runs on a two-screen, interactive video system. The hardware configuration is a Macintosh computer with a hard disc drive hooked to a Pioneer videodisc player and monitor. Videodisc visuals include a 14-minute instructional television program titled "Why are Forests Disappearing?" filmed in Nepal by the Agency for Instructional Technology for its Global Geography series, 11 minutes of colorful outtakes, as well as 378 slides, photographs, maps, artwork, and line drawings collected from a variety of sources. Nepali music occupies part of the second audio track. The computer program, written with HyperCard, includes text, icons, graphics, maps, charts, and graphs–all coordinated with the videodisc visuals.

The main menu (See Figure 1) presents four separate but integrated sections: Information about Nepal, A View from the Top, News at 11:00, and Videodisc Inventory. These are non-linear sections and independent of each other in terms of how or when they should be accessed. Two other functions, the Index and the Notebook, are available from each of these four sections. Each one will be described briefly.

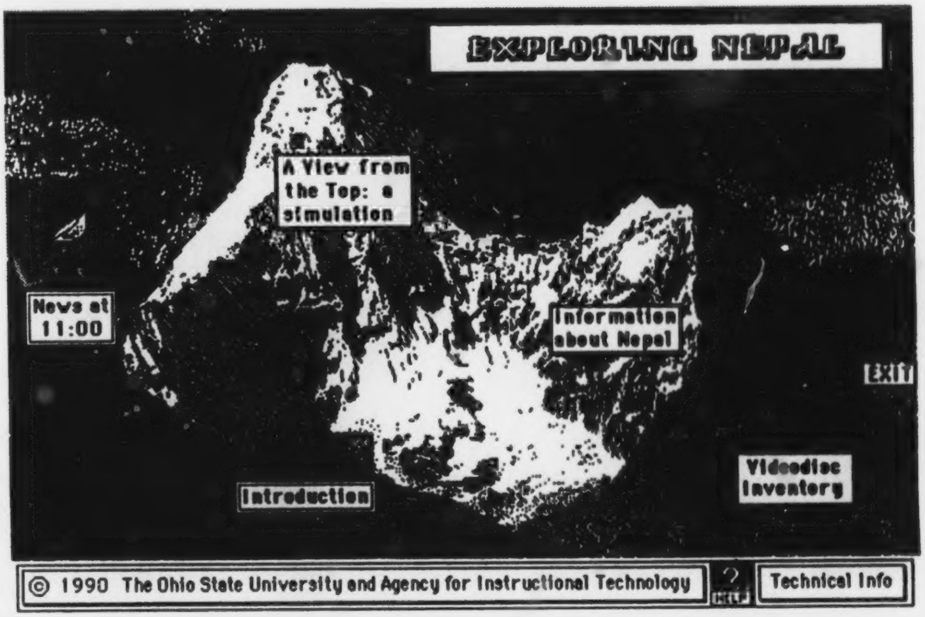
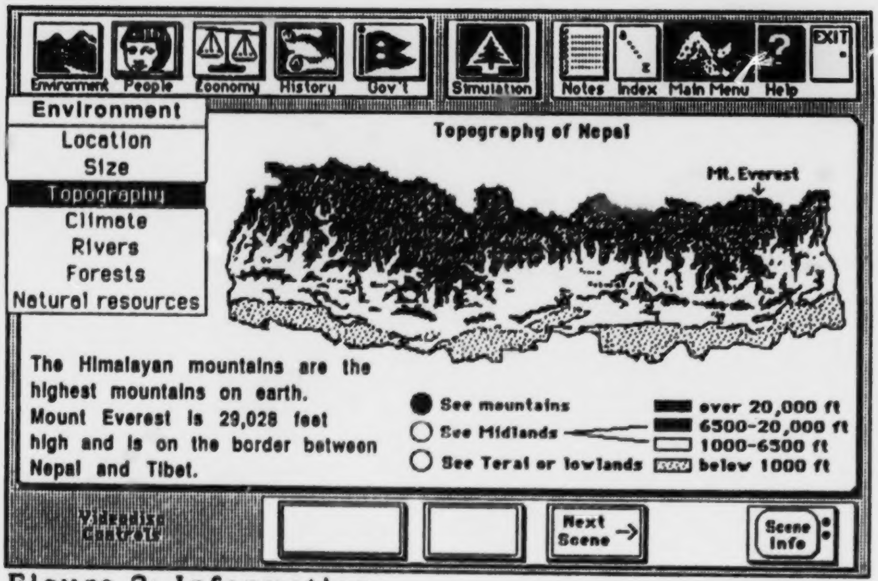

EXPLORING NEPAL
A View from the Top: a simulation
News at 11:00
Information about Nepal
EXIT
Introduction
Videodisc Inventory
© 1990 The Ohio State University and Agency for Instructional Technology
?
HELP
Technical Info

Figure 1: Main Menu


Environment
People
Economy
History
Gov't
Simulation
Notes
Index
Main Menu
Help
EXIT
Environment
Location
Size
Topography
Climate
Rivers
Forests
Natural resources
Topography of Nepal
Mt. Everest
Videodisc Controls
Next Scene →
Scene Info

The Himalayan mountains are the highest mountains on earth. Mount Everest is 29,028 feet high and is on the border between Nepal and Tibet.

● See mountains
○ See Midlands
○ See Terai or lowlands

■ over 20,000 ft
■ 6500-20,000 ft
☐ 1000-6500 ft
▨ below 1000 ft

Figure 2: Information about Nepal

Information about Nepal. Information about Nepal (See Figure 2) is an extensive collection of visual and verbal information about the country of Nepal, accessed by pull-down menus and sub-menus in five major categories: People, Environment, Economy, History, and Government. There are three levels of depth the learner might pursue in perusing the database. At the first level the user finds general information about the five categories named above. At the second level the user might choose to find more information contained in any one of 8-10 subcategories listed under the main categories. At the third level the learner might choose to pursue a sub-category further for more elaborate details on a given topic or a given visual.

A View from the Top. A View from the Top is a problem-solving simulated discussion held in the chambers of the ruler of Nepal, with the user wearing the crown. The topic of the discussion is the central question of the AIT video: "Why are Forests Disappearing?" The issues involved in deforestation are debated in council chambers by a special group of advisors to the ruler, and the ruler/learner is asked to choose from among several proposals discussed or to suggest his/her own course of action after considering the pros and cons presented. Final feedback is provided through newspaper articles appearing five years after the decisions were made.

News at 11:00. News at 11:00 is an editing function inviting the user to create personalized video programs by clipping and reassembling video images from the disc and by writing an original script to accompany the presentation.

Videodisc Inventory. In this section the user has immediate access by topical menu to all of the visuals on the videodisc, allowing users to preview the disc quickly or make notes of specific visuals to be used for demonstration purposes or used in a News at 11:00 presentation.

Index. This section provides an alphabetized listing of key words which are linked to relevant cards in the Information section.

Notebook. The Notebook is a word processor which is available from all parts of the program. The user can keep and later print personal records while using the program.

By design, certain features make "Exploring Nepal" uniquely rich for research purposes. The user, whether student or teacher, has both maximum control over the learning experience and, consequently, maximum responsibility for whatever learning occurs. The effort to maximize user-control is consistent with generative learning theory (Wittrock, 1974), which emphasizes the learner's active participation in the learning experience, the construction of meaning, and the assumption of responsibility for learning. The transparent organization of the computer program allows the user to move easily through massive amounts of verbal and visual information. At all times, the design imperative is for the user to know where s/he is in relation to the whole program, how to get out, how to move to another area, and how to get back.

The flexible design accommodates several types of instructional strategies from the teachers' point of view, including single person use, small group use, and large group demonstration. In addition, it appeals to a variety of learning styles, from visual to verbal, from reflective to impulsive, from field dependent to field independent. The learning outcomes are as varied as the users allow them to be. This free-form instructional system is atypical of materials usually available to teachers, thereby suggesting numerous research questions.

Research in progress

The research in progress explores teachers' perceptions of "Exploring Nepal" in relation to how this program might be used, or not used, assuming they had a program set up like this in their classroom. Nineteen social studies teachers from central Ohio middle or high schools participated in this study on an individual basis during the spring and summer of 1990. They were recruited from a networking process started by suggestions from The Ohio State University professors of social studies education, teaching associates, and colleagues. Information flyers, phone calls, and personal visits were used as contacts with prospective participants. These teachers seemed willing to donate three hours of their time in exchange for exposure to a new educational technology. Each teacher spent approximately one hour to one-and-a-half hours interacting and exploring the program.

Immediately following this interaction, the teacher participated in a structured interview, recorded on audiotape and taking approximately one-half hour. The primary interview question was, "How, if at all, would you use 'Exploring Nepal' in your classroom, assuming you had a Level III Interactive Videodisc set-up like this in your room?" In addition, teacher-participants answered open-ended questions regarding suggested implementation activities, their perceptions of problems and potential of this program for classroom use. Participants were encouraged to express their thoughts and feelings freely, which, when appropriate, were explored for elaborated meanings.

Results of this research are in the process of being analyzed. Hopefully, results will be useful to educational technologists in our attempt to understand the implementation of complex new technologies in tomorrow's schools.

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Mental Imagery, Cognitive Style & Their Effects on Learning Different Levels of Learning Objectives

Richard A. Couch

Introduction

Research has consistently shown that the use of meaningful, relevant visuals is an effective method of supplementing verbal information. Additionally, in most cases, the use of mental imagery has proven to be as effective as supplemental visuals (Finke, 1980; Hanley, 1988; James, 1989; Joseph, 1987).

Speculation on the process of encoding, storing, and retrieving visual information has centered on two theories. The dual-coding theory hypothesizes that the process involves independent but often related mechanisms used for visual and verbal coding (Paivio, 1983). The single code theory (Richardson, 1980) can be explained by the elaborative use of mental imagery; imagery is a series of symbolic representations which may be evoked when stimulated by verbal information or visual information. Richardson (1980) believes that a dual coding model may exist for pictorial memory, but that the use of mental imagery as a learning strategy may require elaboration. The debate continues between those advocates of the single code theory and those of the dual code theory.

A great deal of research has been done recently on the use of mental imagery as a tool for remembering word pairs, word lists, and foreign language vocabulary. Comparatively little research has been done on the use of mental imagery as an aid in enhancing the memory of narrative text or prose. Audio only presentations (a teacher reading to children or an adult listening to an audio tape) seem to enhance memory for prose as compared to the tasks of reading and using mental imagery simultaneously.

The use of self-generated images has been effective for a variety of ages (Hanley, 1989; James, 1989; Joseph, 1987), although there has been little research concerning self-generated imagery and its effect on memory of narrative text or prose. Joseph (1987) found that the use of self-generated mental imagery facilitated the learning of field-dependent students who were reading text from a computer screen. Johnson and Raye (1981) proposed that there is a distinction between the way perceived and imagined information are processed. This distinction involves the automaticity of the process. Imaginal processing is more effortful; perceived processing is more automatic.

Fleming (1983) pointed out that the use of the appropriate imagery process in specific learning conditions with specific outcomes in mind remains a problem for instructional designers or teachers. This is because of insufficient research on different kinds of imagery. Six types of mental imagery have been divided into a typology devised by Hill and Baker (1983). The two types of mental imagery which are most common in the school or training setting are Type 1 and Type 2 as defined by Hill and Baker (1983). Type 1 imagery involves the reconstruction of previous experienced perceptions. Type 2 imagery is the self-generated images one creates when one reads text or listens to an audio passage. It seems appropriate to begin with these two types of imagery in exploring the use of imagery and its interaction with other variables.

Joseph (1987) demonstrated that field-dependent college students performed better with a self-generated imagery rehearsal strategy than with experimenter supplied supplemental visuals. Carrier, et al. (1983) found that the use of imagery for sixth graders was superior to supplied visuals for both field-dependent and for field-independent students.

The research on field dependence-independence indicates that there are individual differences in the way people process visual information. The field-independent person analyzes existing organization and restructures information for meaning when necessary. The field-dependent learner is passive. This learner accepts the structure of organization as it exists and tends to perceive information in a holistic manner often missing the most relevant clues. Field-independent learners tend to perform better on tasks which call for disembedding information, organizing and restructuring information (Witkin & Goodenough, 1981).

The "levels of instructional objectives" variable is of interest because several researchers (Canelos, Taylor & Gates, 1987; Dwyer, 1987) have demonstrated that different teaching/learning strategies have differential effects on different instructional objectives. It seems that self-generated mental imagery requires different cognitive processing than the reproduction of mental images from supplemented visuals; therefore, it was anticipated that the levels of instructional objectives will be affected by the type of imagery strategy.

Psychological differentiation theory and related research generates the hypothesis that the field-independent learner would function at a higher level when using either of the imagery rehearsal strategies of this study than would the field-dependent learner. This is primarily due to the field-independent learner's ability to restructure information. Additionally, it appears from related research that learners will perform better on the Type 1 (reconstructive) mental imagery strategy in this study than in the Type 2 (self-generated) rehearsal strategy. This is primarily due to the redundancy effect of visual, audio and imaginal coding (Paivio, 1971). It was expected that different mental imagery rehearsal strategies would have differential effects on levels of learning objectives. This hypothesis was generated by the research on questioning strategies. Of primary interest is the study by Glover, et al. (1982) in which they found that encoding which requires more difficult decisions are recalled at a higher rate than are items which require less difficult decisions. That is, self-generated imagery would require more encoding decision making than would Type 1 imagery strategies. Conversely, Johnson and Raye (1981) speculated that effortful image generation might reduce a person's ability to simultaneously experience and integrate all the information to solve a problem because the process itself may require most of the person's cognitive resources. This conflict is primarily restricted to the Type 2 (self-generated) imagery strategy.

It is obvious from the research of Witkin, et al. (1971) that when instructional tasks require restructuring in order to encode, store, and retrieve information, field-independent students will out-perform field-dependent students. There are contradictions in the research on the effectiveness of imagery versus imposed visuals as a learning strategy. This issue seems to be bound to individual differences. Levin and Pressley (1983) report conflicting evidence to support both approaches and conclude that for elementary and junior high students imposed visuals are as effective as induced images, and in some cases better. They point out there is not yet evidence to generalize about adults. Because field-dependent students are not very effective in the restructuring of visual information, the use of self-generated imagery may be helpful. Lorayne and Lucas (1974) point out that self-generated mental imagery tends to be idiosyncratic and therefore effective as a memory enhancing device. Alesandrini (1982) points out that the use of mental imagery appears to facilitate meaningful learning, especially for learners who do not process verbal information well. Field-dependent individuals have problems processing visual information, therefore, the Type 2 imagery task, in which students are asked to generate their own mental image rather than process an imposed visual, may prove to be effective as a learning tool for field-dependent individuals. On the other hand, field-independent individuals may perform better after using a Type 1 imagery task because it requires visual and verbal processing using at least two and perhaps three codes: audio, visual, and imaginal. Field-dependent people may be overwhelmed by the complexity of the processing task.

It was expected that different mental imagery strategies will have differential effects on levels of learning objectives. Primarily, it was assumed that self-generated images (Type 2 imagery) are more difficult to produce than reconstructed imagery (Type 1 imagery) (Hill & Baker, 1983). However, because very little research has been done on the use of different types of mental imagery as a rehearsal strategy for the processing of narrative text or prose and on different levels of instructional objectives, the current research could enhance this field. Additionally, the use of imagery as a learning strategy for field-dependent students may prove to be very effective as indicated by the Joseph (1987) study. However, there is very little definitive research on the effects of different types of imagery strategies on cognitive style or on the processing of different levels of instructional objectives. As a way of trying to understand these complex relationships, the following hypotheses were tested:

H#1: Subjects using either imagery rehearsal strategy will perform at a higher level than the control group.

H#2: Field-independent subjects will perform at a higher level on all tasks under all conditions.

H#3: Field-independent subjects will perform at a higher level when they use a Type 1 (reconstructed) imagery strategy.

H#4: Field-dependent subjects will perform at a higher level when they use a Type 2 (self-generated) imagery strategy.

Research Design

A series of two-way Analysis of Variance (3x3 post test only) procedures were used with main effects of imagery rehearsal strategy (Type 1 or Type 2 as defined by Hill's and Baker's Typology) and cognitive style (dividing the field dependence continuum into three groups -- field-dependent, neutral, and field-independent). The effectiveness of these strategies was measured on a series of dependent measures designed to measure different levels of instructional objectives. These dependent measures were taken from the Experimental Instructional Materials (EIM) Criterion Tests, commonly known as the Dwyer Heart Model (Dwyer, 1967). There was a control group which received the information presented and tested on the various criterion tests without any instructions to image as a rehearsal task.

Subjects

The participants were 113 university students, members of intact classes. The subjects were undergraduate students enrolled in either an introduction to educational psychology class or an Introduction to Instructional Technology class. Most were sophomores or juniors. Each intact class was randomly assigned to one of the six different treatments.

Procedure

The Group Embedded Figures Test (GEFT) was modeled after the individual test for relative field-dependence, the Embedded Figures Test, and correlations between the two are high (Witkin, et al., 1971). The GEFT is presented in booklet form. It consists of eighteen scored figures. The score is the total number of simple forms correctly traced -- a 0 to 18 continuum.

For their research, James (1989) and Reardon (1987) divided this continuum into three groups leaving a middle range which indicates a neutral level of field dependence. This approach was used because the difference between a score of 10 and a score of 11 is an arbitrary distinction which in reality may not differentiate between a field-dependent person and a field-independent person. The three levels of the distribution allowed for a more realistic distinction between extreme field-independent subjects and extreme field-dependent subjects.

Instrument

All participants were given a battery of tests which are used with the Experimental Instructional Materials (EIM) (Dwyer, 1967). The EIM has been developed around an 1800 word text and 37 visuals. The design also included a series of five criterion tests: Drawing Test, Identification Test, Terminology Test, Comprehension Test, and Total Criterion Test which is a composite score of the four (4) tests combined (Dwyer, 1987).

Dwyer (1967) developed this 1800 word instructional unit on the human heart, its structure, and the internal processes which are involved during the systolic and diastolic phases. The content of this unit was chosen specifically because it provided a hierarchy of several types of educational objectives extending from the learning of basic facts to complex problem solving.

When proceeding through the content of the EIM material the student first learns the basic terminology, then the basic structures of the heart and how to position them in their specific locations, and then comprehend their interrelated simultaneous functions. The EIM Terminology Test is 20 multiple choice questions designed to measure the knowledge of facts, terms and definitions. "The objectives measured by this type of test are appropriate to all content areas which have as a prerequisite to the more complicated types of learning a comprehensive understanding of the basic elements (terminology, facts, and definitions) indigenous to the discipline" (Dwyer, 1978, p. 45).

The objective of the EIM Drawing Test is to evaluate student ability to construct and/or reproduce items in the appropriate context. The Drawing Test gives the students a list of terms (18 items) corresponding to parts of the heart. The students are required to draw a diagram and put the number of the part in its proper location.

The objective of the EIM Identification Test is to evaluate the student's ability to identify parts or positions of an object. It is a multiple choice test (20 items) which requires the subject to identify the numbered parts on a detailed drawing of the heart. The objective of the Identification Test is to measure the student's ability to use visual cues to discriminate one structure of the heart from another and to associate specific parts of the heart with their proper names (Dwyer, 1978). This test measures the student's ability to "recognize" pertinent information.

The EIM Comprehension Test also consists of 20 multiple choice questions. Subjects are given the location of parts of the heart at a moment in its functioning and asked to locate the position of other parts of the heart at the same point in time. This test requires a thorough understanding of the functioning of the heart in its systolic and diastolic phases. This test was designed to measure understanding of the procedures and processes of the heart. Students must be familiar with the terminology used to describe the heart, be able to recollect the location of various parts and how they relate to each other, and be able to simulate mentally the functions and movements of the various parts of the heart as they would occur during both the systolic and diastolic phases (Dwyer, 1987). This test would measure the ability to apply information to a process.

The Total Criterion Test is the composite of the four previous test scores (78 items). This score indicates an overall understanding of the content presented. The scores on these tests should be a reflection of the effectiveness of the instructions to image rehearsal strategy as it applies to different levels of learner objectives (Dwyer, 1978).

Students received the Drawing Test first, then the Identification and Terminology Tests and the Comprehension Test last. Each student was allowed thirty (30) minutes to take the four tests. The Kuder-Richardson Formula 20 Reliability coefficient for the five criterion measures was computed. An average reliability coefficient for each criterion test has been computed from a random sampling of studies which use this material: .83--Terminology Test, .81--Identification Test, .83--Drawing Test, .77--Comprehension Test, and .92--Total Criterion Test (Dwyer, 1978).

Participants were given the Group Embedded Figures Test to determine whether they were field-dependent, field-independent or somewhere on the middle of the continuum. They were also given a pre-test devised by Dwyer (1987) to determine if they had any in-depth knowledge of the anatomy and physiology of the human heart. Dwyer devised this test to assure that the results of studies using his materials would not be confounded by students who have a great deal of knowledge about the human heart.

Each intact group was given a treatment. Treatment One was an audio/visual presentation via linear video tape. The tape included the EIM (Dwyer, 1967) text and visuals. The visuals were "simple line drawings" which have been shown to be effective in introducing new material to students (Dwyer, 1987). They were also given instructions to image after each visual. The participants were given five (5) seconds to recreate the visual representation in their "mind's eye."

Treatment Two was given an audio only presentation of the 1800 word text of the EIM and asked to generate their own mental image of what was being presented via audio tape. They were given the same amount of information and the same processing time as Treatment One.

The third treatment was the control treatment in which the students were given the same information via linear video tape as in Treatment One without the instructions to image. They were given equal time to process the information as Treatment One subjects. After each intact group was given their appropriate treatment, the EIM tests were given.

Results

Hypothesis #1: Students using either imagery rehearsal strategy will perform at a higher level than the control group.

For the groups using either type of imagery rehearsal strategy or the control group, there was no significant difference in mean scores for the dependent variable "to translate spatial information" as measured by the Dwyer Drawing Test F(2,104)=1.02, p >.05. (See Table 1 for Means.)

For the groups using either type of imagery rehearsal strategy or the control group, there was no significant difference in mean scores for the dependent variable "to know specific facts" as measured by the Dwyer Terminology Test, F(2,104)=.02, p>.05. (See Table 2 for Means.) For the groups using either type of imagery rehearsal strategy or the control group, there was no significant difference in mean scores for the dependent variable "to apply information" as measured by the Dwyer Comprehension Test, F(2,104)=.53, ,p>.05. (See Table 3 for Means.)

However, for the dependent measure of "to discriminate" or "to associate" (the recognition task) as measured by the Dwyer Identification Test there was a significant difference in mean scores, F(2,104)=16.441, p<.05, between the treatments (type of imagery strategy). (See Table 4 for Means.) Using the Fisher Test, t= 1.649, p<.05, it was determined that the significant difference in mean scores occurred between the self-generated imagery (x=10.67) and recreated imagery (x=15,41) groups. It was also determined that a significant difference, t = 1.612, p<.05, occurred between the self-generated imagery group (x=10.67) and the control group (x=15.05).

For the groups using either type of imagery rehearsal strategy or the control group, there was no significant difference in mean scores for the dependent variable Total Criterion Test, the total of all four measures, F(2,104)=2.22, p>.05. (See Table 5 for Means.)

Table 1

Summary Table of Means and Standard Deviations by Main Effects (Drawing Test)

	Treatment	(Type of	Imagery)	
Group	Self-Gen	Recr	Control	Total
Field-neutral				
n	13	5	4	22.0
Mean	10	10.8	11.25	10.41
SD	3.44	2.39	6.70	3.81
Field-dependent				
n	17	13	15	45
Mean	10.35	11.31	11.27	10.93
SD	5.35	3.17	4.1	4.32
Field-independent				
n	12	16	18	46
Mean	12.5	14.5	14	13.78
SD	5.42	2.48	3.74	3.89
Totals				
n	42	34	37	113
Mean	10.86	12.74	12.56	11.99
SD	4.86	3.17	4.34	4.29

NOTE: Maximum possible score = 18

Table 2

Summary Table of Means and Standard Deviations by Main Effects (Terminology Test)

	Treatment	(Type of	Imagery)	
Group	Self-Gen	Recr	Control	Total
Field-neutral				
n	13	5	4	22
Mean	10.08	9	9.75	9.78
SD	3.23	3.74	5.19	3.56
Field-dependent				
n	17	13	15	45
Mean	11.11	11.69	11.6	11.44
SD	3.67	4.15	3.33	3.63
Field-independent				
n	12	16	18	46
Mean	13.33	14	13.72	13.72
SD	4.81	2.19	2.16	3.02
Totals				
n	42	34	37	113
Mean	10.43	12.38	12.43	12.04
SD	4.03	3.65	3.27	3.68

NOTE: Maximum possible score = 20

Table 3

Summary Table of Means and Standard Deviations by Main Effects (Comprehension Test)

	Treatment	(Type of	Imagery)	
Group	Self-Gen	Recr	Control	Total
Field-neutral				
n	13	5	4	22
Mean	10.23	11	9.25	10.28
SD	2.09	3.16	3.86	2.62
Field-dependent				
n	17	13	15	45
Mean	8.65	9.08	9.27	8.98
SD	3.33	2.78	3.56	3.20
Field-independent				
n	12	16	18	46
Mean	13	10.69	10.94	11.39
SD	2.86	2.92	3.23	3.12
Totals				
n	42	34	37	113
Mean	10.38	10.12	10.08	10.2
SD	3.33	2.93	3.44	3.22

NOTE: Maximum possible score = 20

Table 4

Summary Table of Means and Standard Deviations by Main Effects (Identification Test)

Group	Treatment (Type of Imagery) Self-Gen	Recr	Control	Total
Field-neutral				
n	13	5	4	22
Mean	10.08	15.4	13.75	11.96
SD	3.97	2.88	5.56	4.54
Field-dependent				
n	17	13	15	45
Mean	10.53	14.54	14.13	12.89
SD	4.24	4.20	2.64	4.13
Field-independent				
n	12	16	18	46
Mean	11.5	16.13	16.11	14.91
SD	4.38	2.94	2.52	3.76
Totals				
n	42	34	37	113
Mean	10.67	15.41	15.05	13.53
SD	4.14	3.45	3.06	4.21

NOTE: Maximum possible score = 20

Table 5

Summary Table of Means and Standard Deviations by Main Effects (Total Criterion Test)

Group	Treatment (Type of Imagery) Self-Gen	Recr	Control	Total
Field-neutral				
n	13	5	4	22
Mean	40.39	46.2	44	42.36
SD	9.33	10.35	20.9	11.79
Field-dependent				
n	17	13	15	45
Mean	40.65	46.77	46.27	44.29
SD	13.60	12.32	11.63	12.65
Field-independent				
n	12	16	18	46
Mean	51.67	55.31	54.83	53.78
SD	15.05	8.02	10.11	10.96
Total				
n	42	34	37	113
Mean	43.27	50.71	50.20	47.78
SD	13.37	10.81	12.6	12.76

NOTE: Maximum possible score = 78

Hypothesis #2: Field-independent students will perform at a higher level on all tasks under all conditions.

For all but one of the dependent measures (Dwyer criterion tests) it was found that field-independent students tended to be more effective in the learning of information at all levels of objectives. For field-independent students and field-dependent students there was a significant difference in mean scores, F(2, 104)=5.89, p<.05, for the dependent measure "to translate spatial information" as measured by the Dwyer Drawing Test. (See Table 2.)

For field-independent students and field-dependent students there was a significant difference on the mean scores, F(2,104)=9.85, p<.05, on the dependent measure "to know specific facts" as measured by the Dwyer Terminology Test. (See Table 3.)

For the dependent measure "to apply information" as measured by the Dwyer Comprehension Test a significant difference in the mean scores was found between field-independent and field-dependent students, F(2,104)=7.69, p<.05. (See Table 4.)

For the dependent measure "to discriminate" or "to associate" (a recognition task) as measured by the Dwyer Identification Test there was no significant difference in the mean scores for field-independent students and field-dependent students, F(2,104)=2.25, p>.05. Field-independent students' mean score (x=14.91) on this dependent measure was not significantly different than the field-dependent students' mean score (x=12.89).

For field-independent students and for field-dependent students there was a significant difference in mean scores on the Total Criterion Test, i.e. the total score of all four (4) dependent measures, F(2,104)=7.76, p<.05. (See Table 5 for Means.)

The hypothesis that field-independent students would perform better on all the dependent measures was confirmed except on the recognition task.

Hypothesis #3: Field-independent students will perform at a higher level when they use a Type 1 imagery strategy.

There was no significant interaction between type of imagery rehearsal strategy and cognitive style. As expected field-independent students tended to perform at a higher level on all dependent measures except in the Identification Test. When comparing mean scores on the dependent variable "to translate spatial information" as measured by; the Dwyer Drawing Test there was no significant difference, F(2,104)=1.02, p>.05, between either type of imagery rehearsal strategy for field-independent students nor for the control group. (See Table 2 for Means.) The same lack of effect occurred for the dependent variable "to know specific facts" as measured by the Dwyer Terminology Test, F(2,104)=.02, p>.05 (See Table 3 for Means.), the dependent variable of "to apply information" as measured by the Dwyer Comprehension Test, F(2,104)=.53, p>.05 (See Table 4 for Means.), and the Total Criterion Test, the total score of all four measures, F(2,104)=2.22, p>.05 (See Table 5 for Means.).

Hypothesis #3 was not confirmed. The type of imagery strategy had no effect on field-independent students. They had higher scores on all tests no matter what imagery strategy they used.

However, on the Identification Test there was a significant difference in the mean scores comparing type of imagery strategy (self-generated imagery, x=11.5, recreated imagery, x=16.25, and the control group, x=16.11). These findings indicate that neither type of imagery strategy is more effective for field-independent students.

Hypothesis #4: Field-dependent students will perform at a higher level when they use a Type 2 imagery strategy.

Hypothesis #4 was not confirmed. Field-dependent students did not perform better on any of the dependent measures when using a Type 2 imagery strategy: Drawing Test, F(4,104)=1.02, p<.05; Terminology Test, F(4,104)=.02, p<.05; Comprehension Test, F(4,104)=.53,p<.05; Total Criterion Test, F(4,104)=2.22, p<.05. Mean scores were significantly different (lower) on the Identification Test, F(4,104)=16.441, p<.05. (See Tables 1,2,3,4,5 for Means Tables.)

Discussion

This study demonstrated that on all but one of the dependent measures, the imagery rehearsal strategies were not more effective than the control group. However, on the Identification Test, significant differences in mean scores were found for the type of imagery variable. For the Identification Test only, those students who used a Type 1 (recreated) imagery strategy, that is, those students who were presented with a visual and then asked to use imagery to remember the information, scored higher than the students using the Type 2 (self-generated) imagery strategy. The self-generated imagery strategy asked the students to listen to an audio version of the experimental text and then try to remember the content by creating mental images. Those students in the control group who received no instructions to image also performed better on the Identification Test than the self-generated imagery group. However, there was no significant difference in the scores of any of the other criterion tests. Apparently not all types of imagery are effective for all tasks. The results of this study indicated that self-generated imagery was not effective on a recognition type learning task, in fact the mean scores were lower for this strategy.

In general, this study demonstrated that imagery is not more effective than other rehearsal strategies. These results are contrary to the findings of the Joseph (1987) study which found that self-generated imagery was more effective for field-dependent students. In this study self-generated imagery was less effective on the Identification Test for all students no matter what their cognitive style. Hanley (1988) speculated that the effortful process of self-generated mental images could require most of the person's cognitive resources, thus not permitting any additional information to be processed. It must be pointed out, however, that this effect was only evident on the Identification Test and not on any of the other criterion tests.

Another line of imagery research has focused on the possibility that the reading process itself interferes with a student's ability to effectively use mental imagery. Rasco, Tennyson and Boutwell (1975) found that college students who used imagery while reading performed better than students who were presented with pictorial information while reading. Several researchers found that the act of reading may interfere with the student's ability to use imagery (Brooks, 1967; Levin & Divine-Hawkins, 1974). These two studies found that students who used imagery while listening to a teacher read performed at a higher level than students who used imagery while reading the same material themselves. Alesandrini (1982), in her review of the literature on imagery also discovered that the imagery effects in many studies may have been more dramatic had the subjects listened to the text rather than been required to read it. Joseph (1987), on the other hand, asked students to read from the computer screen and found that field-dependent students using self-generated imagery performed at a higher level on a series of tests. Many of these researchers have speculated that the combination of imagery as a rehearsal strategy and the cognitive requirements of the reading process may effect the student's ability to process prose information. However, given this conflicting research, the current study was designed to use audio presentations to control for this possible reading effect. No differences were found in the scores of students who used either type of imagery except on the Identification Test.

Lorayne and Lucas (1974) believe imagery is idiosyncratic. Because students tend to develop their own unique images when they hear a text passage, these researchers believe that this uniqueness could help students process information into individual memory for further recall. This new imagery information is stored in an existing schema unique to the individual. The uniqueness of the memory will then aid students in the retrieval of information. This advantage was not demonstrated in the current study. The imagery strategies were no more effective than the control group which did not use imagery. But, in the case of the low-level recognition task as measured by the Identification Test, the self-generated imagery strategy proved to be even less effective than the control strategy or the recreated imagery strategy.

Previous studies on the use of imagery have focused on enhancing memory of word pairs, free recall of a list of words and other low-level recall tasks (Levin, 1981; Levin, et al., 1978; Pressley, 1977; Pressley, et al., 1982). The current study attempted to explore the possibility that different types of imagery might help the learning of higher levels of instructional objectives. In this line of research, difficult decision making (Glover, et al., 1982) had proven to be an important factor. That is, encoding which requires more difficult decisions is recalled at a higher level than is information which requires less difficult decisions. It was speculated that the use of imagery, either self-generated or recreated, requires elaborate decisions on how to encode, store and retrieve it. Because of these elaborate decisions, memory would be enhanced, especially at the higher levels of instructional objectives. This did not prove to be the case in the current study; there was no significant difference on the tests which measured higher level learning: the Terminology Test, the Drawing Test, or the Comprehension Test. Perhaps the length and difficulty of the text for the Dwyer materials did not allow enough time for the students to make the numerous decisions which were required to process the information. Perhaps the large number of images which had to be created from the 1800 word Dwyer material may have affected the encoding, storing and retrieving of that information. The unexpected result that self-generated imagery on the Identification Test was less effective than the recreated imagery and less effective than the control group, may be explained by the "simplicity" of the task. The Identification Test requires the subject to simply match labels with a picture. No difficult decisions are required to encode, store or retrieve this type of information. This study did not reinforce the Glover, et al. (1982) theory that difficult decisions aid instruction.

Field-independent students are generally characterized as active participants in restructuring and organizing visual/spatial information while their field-dependent counterparts are characterized as passive and less able to restructure and organize visual/spatial information (Witkin, et al., 1981). Because of this ability to process visual information it was expected that field-independent students would perform at a higher level on all dependent measures. This expected result was confirmed on four of the five criterion tests thus reinforcing the existing research on the effect of the field-independent cognitive style (Canelos, et al., 1981; James, 1989; Joseph, 1987; Reardon, 1987; Witkin, et al., 1981).

The field-independent students did not score significantly higher than field-dependent students on the Identification Test which measures the ability to discriminate or to associate. This criterion test was designed to measure the lowest level of learning objective in this series of tests, the ability to recognize and match labels with a picture. Both cognitive styles performed at relatively the same level on this one test. Field-dependent students tend to process visual/spatial information in a global manner rather than break it up and restructure it as field-independent students do (Witkin, et al., 1981). It is speculated that in order to perform well on this particular dependent measure it was not necessary for students to restructure the visual information. Field-dependent students appeared to store information in a global manner and still retrieve it effectively enough to answer the questions on the low level Identification Test. On the other hand, field-independent students tend to perform at a higher level on tasks which require visual processing of information, specifically organizing and restructuring of that information for further retention (Canelos, et al., 1981; James, 1989, Joseph, 1987; Reardon, 1987). This ability was demonstrated by the field-independent students' higher scores on the other dependent measures. Field-independent and field-dependent student scores on the Identification Test were similar which indicated that they were able to perform at the same level on the Identification Test but not on the other tests. This latter outcome was unexpected.

This study failed to identify any interaction between type of imagery strategy and cognitive style on the learning of different levels of instructional objectives. The use of different types of imagery strategies did not improve the learning of either field-dependent students or field-independent students. The hypothesis that self-generated imagery would aid field-dependent students was not confirmed. The hypothesis that recreated imagery would work better for field-independent students also was not confirmed; no particular strategy was superior for the field-independent students. The lack of interaction was inconsistent with the Joseph (1987) study which reported that field-dependent students performed at higher level on the Dwyer (1967) Criterion Tests when they were asked to generate their own mental images. However, no other similar findings have been reported. The major difference in the two studies seems to be that the students in the Joseph study were allowed to use as much time as they wanted to sit, read, and draw the images they created. Then they would move on to the next screen. This self-pacing rather than machine-pacing may have contributed to the difference in these two studies.

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THEORY

Visual Literacy: Investigation of Visual Literacy Concepts as Historically Developed in the Writings of Selected Western Philosophers from the Pre-Socratics to Comenius

Susan B. Leahy

Introduction

Visual Literacy is a concept, an educational movement, and a controversial metaphor. Since its inception in 1969, researchers in the field have developed definitions, theoretical models, and operational constructs. Interested scholars in fields as diverse as art, psychology, philosophy, and linguistics have converged upon a common interest in visual literacy commensurate with the explosive growth of visual communication in the 20th century. The term, visual literacy, is herein defined as "...the ability to understand and use images, including the ability to think, learn, and express oneself in terms of images" (Braden & Hortin, 1982, p. 41).

An investigation examining connections between current conceptual definitions of visual literacy and major Western philosophical thought specific to those conceptual definitions should provide access to some seminal issues relative to the development of the visual literacy concept. The investigatory question, then, becomes: What have selected Western philosophers from the Pre-Socratics to Comenius contributed to current understanding of the concept, visual literacy, including the basic constructs of understanding images, using images, and thinking, learning, and expressing oneself in terms of images?

The dual nature of the visual literacy definition demands dichotomous treatment of the question. Philosophical discussions concerning understanding images must be examined along side philosophical discussions concerning using images.

General Findings

In general, most philosophical discussions about understanding images fall under the basic psychological categories of sensation, perception, and knowledge. In addition, historically, the visual image gradually gained importance in retention and recollection, and in memory and learning as the classical philosophers injected thinking into the process of knowing. In this way, understanding images became a necessary part of early epistemological thought. As philosophical thought progressed into the Middle Ages, understanding images in the context of nonverbal communication arose as well. Signs, symbols, and gestures gained recognition as bearers of meaning in nonverbal settings. At the same time, Medieval philosophers began to disagree over the rightful status of the visual image and its role in learning. Some thinkers exalted the image as the all-important point between sense data and universal concepts. Other thinkers described the image as a mere starting point that humankind directly, intuitively, and universally understands. By the time of Comenius, Renaissance philosophical thought emphasized the visual image as a vital player in the prevailing sense realist theory of knowledge.

Second, in general, most philosophical discussions about using images are found within specific discussions that philosophers began to take up in the areas of astronomy, anatomy and medicine, botany, mathematics, architecture, theology, educational practice and mnemonics. Interestingly, some philosophers actually used images themselves within the context of visual communication: in astronomy, Ptolemy constructed starmaps and planetary globes; in anatomy and medicine, Aristotle used anatomical illustrations in Lyceum student texts; in botany, Theophrastus may have developed illustrations of specimens previously only verbally described; in mathematics, Pythagoras, Socrates, and Plato used visual images to teach geometry; in architecture, Vitruvius developed the dual constructs of imagination (understanding the architectural image) and invention (using the architectural image); in theology, Aquinas used imagery as metaphor for the Holy Scriptures; and, in educational practice, Quintilian, Erasmus, and Comenius encouraged the tactile, kinesthetic skill of creating images in reading the writing instruction.

Provocateurs of Seminal Issues

Building upon these general findings, the investigation of visual literacy concepts as historically developed in the writings of selected Western philosophers from the Pre-Socratics to Comenius reveals eight Western philosophers who emerge as provocateurs of seminal issues related to visual literacy. The eight men are: Aristotle, Quintilian, Vitruvius, Ptolemy, Augustine, Aquinas, Ockham, and Comenius.

Aristotle

In discussions on understanding images, Aristotle designated recollection as a physiological causal chain that produces changes in the nervous system. Centuries later, this belief emerged as a conceptual tenet of the psychological foundations of visual literacy used to explain how images are understood, how visual learning occurs, and how visual training becomes possible. Another thread weaving through the centuries to emerge as a fully credited psychological tenet of visual literacy is found in Aristotle's explanation of associationism and the appeal of the visual image to learners. In setting forth the conceptual idea that certain elements of visual grammar are necessary to visual composition and appeal, he provided a seminal notion that art and visual literacy theorists Arnheim (1969, 1986) and Dondis (1973) further refined.

As for Aristotle's use of images, as an educator, he supplemented verbal learning with visual representations in anatomy texts he prepared for Lyceum students. He further encouraged students to think and learn in terms of images by recommending illustrated anatomy texts of the day as supplements to his own. This classical thinker initiated several provocative threads of thought contributing to current understanding of the visual literacy concept today.

Quintilian

Quintilian's contributions to current understanding of visual literacy lie in his educational methodology that was dependent on visualization as an aid to student recall, on developmentalism as a psychological base for learning, and on kinesthetic manipulation of the visual representations of the alphabet as a preface to reading and writing. All three of these areas are of certain relevance to visual literacy conceptualists today. He reviewed philosophical opinion of the day concerning functions of the human mind in memory and mnemonic techniques in oratory which link in method and rationale with present-day concepts in visual literacy. Of special interest was his choice of the verbal metaphor to explain the visual events of mnemonics. This choice created an ancient kinship between Quintilian and today's visual literacy advocates who believe the verbal metaphor is properly assigned to the very name of the field-Visual Literacy.

Vitruvius

An additional contributor of the Roman period was the philosopher-architect, Vitruvius. Vitruvius forwarded a provocative idea that presaged rather distinctly the dual constructs of visual literacy. In delineating the aspects of arrangement in architecture, he described two components. Those two components were imagination and invention. Imagination was the attention paid toward understanding the architectural image. Invention was the creation of the architectural image. Vitruvius, thus, provided the seminal basis for the dual modalities of understanding and using images, the input-output constructs of visual literacy generic to most definitions of visual literacy today.

Ptolemy

Ptolemy's contribution to current understanding of visual literacy was his mathematical systematization of the visual image in cartography. His system of latitude and longitude provided a precise, uniform, universal method to visualize the earth's surface. At that point, understanding and using images became, for the first time, observable skills that today have their place in the social sciences and IQ testing as skills to be mastered by the visually literate student.

Augustine

St. Augustine, philosopher-theologian, contributed two aspects toward current understanding of visual literacy. In direct continuation of Aristotle's thought, Augustine designated a series of visual elements including harmony, unity, number, proportion, and order as necessary to visual composition. Today's visual literacy theorists believe that precise attention must be paid to these grammatical elements of visual language to produce visual composition understandable to the viewer, a stance finding support in both Augustinian and

Aristotelian thought.

Secondly, Augustine pioneered the notion of nonverbal communication through signs, symbols, and gestures. His recognition of nonverbal communication signaled the embryonic beginnings of the concept of body language and of object language, both components of the psychological foundations of visual literacy.

Aquinas

Following Augustine, Aquinas bolstered the idea of the supremacy of the visual image as a permanent foundation of intellectual activity by raising the image to a lofty position of necessary condition in his epistemological thought. Aquinas rediscovered the injected Aristotelian thought on reminiscence and laws of association and order into his own discussions on the visual image. Sharing Aristotle's views that memory belonged to the images of sense perception, Aquinas developed a mnemonic tradition whereby the weak human soul could remember subtle and spiritual truths in a unique blend of philosophy and theology, so typical of the Middle Ages. By refiring the Aristotelian threads of philosophical continuity and theologizing the mnemonic tradition, Aquinas contributed to current understanding of visual literacy.

Ockham

Ockham, in contrast to Aquinas, sharply rejected the representative theory of perception, thereby removing the image from its lofty position. He believed humans understood images directly, intuitively, and universally. So it was that over 500 years ago, Ockham framed the same controversy that has resurfaced today over tenability of visual literacy as a concept. Current opponents who treat visual literacy as a failed metaphor--as an ability shared by most people, if not all, as a general human condition--are not, then, the first to attack the foundational notions and constructs underlying the concept.

Comenius

Comenius emerged as a stellar example of a philosopher-educator who contributed more systematically and comprehensively than any of his predecessors toward current understanding of visual literacy. Comenius and 20th century visual literacy advocates share certain commonalities in educational methodology, theory, and practice in developmentalism, associationism, nonverbal communication and language acquisition, and recognition of visual learning styles.

His illustrated Latin-Vernacular text, *Orbis Pictus*, clearly reflected Comenius' belief that understanding images and factors of visual sensory experience were too important to be left to chance, a sentiment echoed in visual literacy literature today. His practice of associating like with like using visual methods, ocular aids, and creative production of visuals is in direct line with modern visual literacy methodology. Comenius' conclusion that nonverbal communication between parent and child is prior to and the basis of later language acquisition and development is a remarkably modern conception that visual literacy advocates support as part of visual language. His "see-it-draw-it" disposition encouraged a visual style of instruction and learning. A pivotal figure, Comenius was the first Western philosopher-educator to develop educational tenets, methodology, and specific practice firmly based on the constructs of visual literacy in seeming devotion to the importance of understanding images and using images to think, to learn, and to express oneself.

Conclusions

Though the term, visual literacy, is new and up-to-date, visual literacy is not a new idea. Visual literacy finds it constructural roots deep within an extensive body of selected Western philosophical thought. Even 2,000 years ago, thinkers enumerated germinal philosophical threads which have woven the multitextural fabric of visual literacy, controversy and all. Though study of the philosophical past may reveal much of what has been, it can offer no insight into what will come to be. That power lies with humanity and the ways humanity harnesses the power of ideas. Harnessing the powerful ideas and concepts of visual literacy to serve the needs of educational practice in the visually explosive 20th century is the approach some philosophers would surely recommend.

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Toward a Conceptual Map for Visual Literacy Constructs

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Introduction

Visual Literacy: Mapping the Field was the theme of a major international symposium held in London during the summer of 1990. The reference to a map implies a continuing concern with organizing the field of visual literacy, with providing a guide to the field which would make it accessible to students and scholars, and with presenting it in visual form. The authors of this paper are similarly committed to achieving these goals. Toward that end, a visual "conceptual map" of the concepts which underlie visual literacy is proposed and discussed in this paper. Whether that conceptual map is to be completed by these authors depends, in part, upon the reaction to this proposal.

Background

Several attempts have been made to analyze visual literacy sufficiently to provide some organization and structure for the discipline. Some of the scholars involved in those attempts dealt with visual literacy's theoretical framework and the integration of theory and research from other fields (Hortin, 1980: Braden & Hortin, 1981, 1982; Clark-Baca & Braden, 1990a, 1990b), while others have categorized the many aspects of visual literacy (Braden, 1987). Still others have attempted to organize visual literacy research and literature (Jonassen & Fork, 1975; Fork & Jonassen, 1976; Griffin & Whiteside, 1984; Levie, 1978; Walker, 1990).

Visual literacy isn't exactly an infant field, but almost. As we reckon maturity, visual literacy came of age on its twenty-first "birthday"--as marked by its twenty-first annual conference in 1990 at Bloomington, Illinois. In twenty-one years the field has gone through several developmental phases, beginning with an early theorizing stage dominated by Jack Debes and Clarence Williams. By the mid-seventies scholars began to show an interest in research about visual literacy (Jonassen & Fork, 1975; Fork & Jonassen, 1976: Levie, 1978). This was the phase of conjecture about the nature of the field (There are lingering vestiges of this phase even today.) As a sign of the times, Lida Cochran and a group of her students even held a session about visual literacy research topics at the 1976 AECT convention. The questions at that time were, "What research needs to be done?" and, "Where to begin?".

Eclectic Theory, Interdisciplinary Participation-- The first major research study delving into the nature of visual literacy dealt with its basis in theory (Horton, 1980), and reflected the influence of Fork who had written what is now an obscure (and maybe lost) pamphlet on the foundations of visual literacy (Fork, 197?). From the Horton study forward it is clear that visual literacy as a discipline is ideologically eclectic. That is, it has drawn on the theory and practice of many other fields, melding parts of this and parts of that into an amalgamated (thus eclectic) set of interlocking ideas. None of the parent fields participate in visual literacy activities, per se, so it cannot be classified as an interdisciplinary field. However, the individuals who are actually concerned with visual literacy come together in the International Visual Literacy Association (IVLA), an organization with an interdisciplinary membership.

Restructuring Follows Research-- In 1981, shortly after Horton published his research findings (Horton, 1980), he and Braden entered into a collaborative theorizing process that resulted in an early attempt to provide structure to the eclectic bits and pieces of visual literacy theory (Braden & Horton 1981, 1982). The effect of that work was mostly transient, but two characteristics persist as goals that are still worthy. First, there was an attempt to create concept categories with identified relationships and labels that would serve this new field's need to simplify communication amongst its interdisciplinary practitioners. Second there was an attempt to embed those concepts and labels in visual models that portrayed the relationships.

The structure that Braden and Horton postulated identified three basic categories of relationship. This theoretical structure with its eclectic origins was presented visually as a set of venn diagrams of the relationships between areas of visual literacy. The nature of the three basic relationships was reflected in the names given to them. Thus various ideas, interest areas, and even entire disciplines were categorized as *included*, *interactive*, or *related* to visual literacy. The first two of those relationships are shown in Figure One.

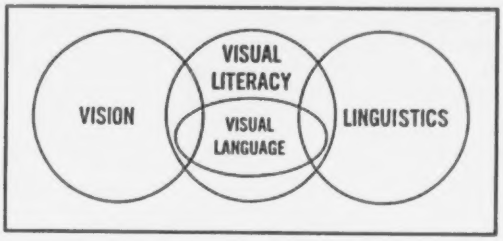


Fig. 1. "Interactive" Examples
(reprinted with permission)

Braden and Hortin used the term included for topics and fields which are subsumed by visual literacy. Visual language was given as an exaample of a topic which is part of, or included in, visual literacy. *Interactive* was the term applied to fields concerned with concepts which overlap the concerns of visual literacy. Linguistics and the study of vision were given as examples of fields which are interactive with visual literacy. The term *related* was used to denote a more remote relationship between a concern common to visual literacy and another field. Fine art, with its emphasis on aesthetics, was given as an example of a field related to visual literacy. That relationship was visualized with the second venn diagram, reprinted here as Figure Two.

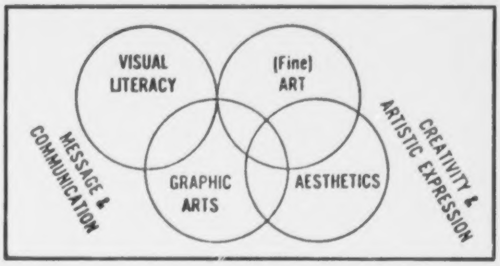


Fig. 2. "Related" and "Interactive" Examples (reprinted with permission)

While Braden and Hortin identified broad fields of study and a range of possible relationships between those fields and visual literacy, specifying the components of these fields was left to future researchers.

Braden and Horton conceded that the three relationships would not cover everything, Therefore, they provided another venn diagram as a model for amorphous, unresolved, or changing relationships. The actual example given was of the undetermined relationship between visual literacy and the field of cognitive psychology, as shown in Figure Three.

Others speculated about the appropriate structure for the study of visual literacy. Griffin and Whiteside (1984) suggested that to understand the visual literacy field, it should be approached from three perspectives. The perspectives were:

(1) a theoretical perspective
(2) a visual language perspective
(3) a presentational perspective

Griffin and Whiteside also offered a model into which their three perspectives fit. In essence, their model for visual literacy was an application of the well known Berlo Model of Communication (Berlo, 196_). The critical features of Griffin and Whiteside's proposal that mirror those of Braden and Horton are (1) visual literacy was broken into sub-areas, and (2) a model was supplied to convey the relationships.

In 1987 Braden proposed a structure for the field in which he identified three "domains" of visual literacy and categorized some elements according to those three domains. The three domains were as follows:

1) visualization,
2) theory-research-practice, and
3) technology.

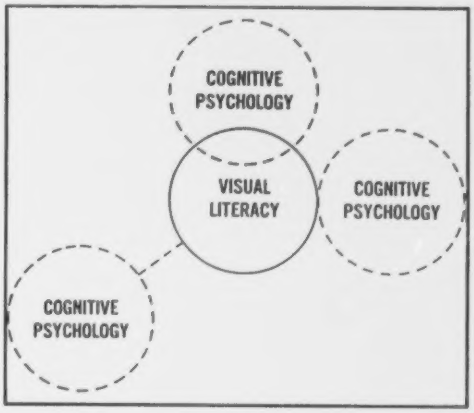


Fig. 3. Unresolved Relationship (reprinted with permission)

The domain of visualization was described as including "aspects of vision in the human processes of thinking and communication" (p. 7). Among the elements he listed in the domain of visualization were visual syntax, visual design, visual expression, visual thinking, critical viewing skills, and visual-verbal interaction. The second domain was described as "the theory-research-practice [t-r-p] trilogy as it applies to visual literacy" (p. 6). The elements of this domain included instruction, design, communication, persuasion, critical viewing skills, and visual-verbal interaction. The third domain, that of technology, was said to involve "...the impact of technological advances upon visualization and the t-r-p trilogy (p. 6). Specific technologies mentioned included electronics and television, computers, and reprographics. A graphic representation of these domains is included here as Figure Four.

Constructs of Visual Literacy

The aspects of visual literacy discussed have varied from one scholar to another. In fact, in addition to the theories and studies mentioned here, the literature abounds with descriptions of visual literacy theory, applied programs, and research projects which address diverse components of visual literacy.

In spite of this growing body of literature, there has been no strong statement of agreement as to what the components of visual literacy actually are. Then in 1989 Clark-Baca began her Delphi Study, involving many key figures in the field, to fill that void. The study was conducted in an attempt to generate a comprehensive description of the components of visual literacy and to identify the level of agreement upon those components.

Clark-Baca's study (1990) involved eliciting input from a group of 52 scholars who met specified criteria and were identified as

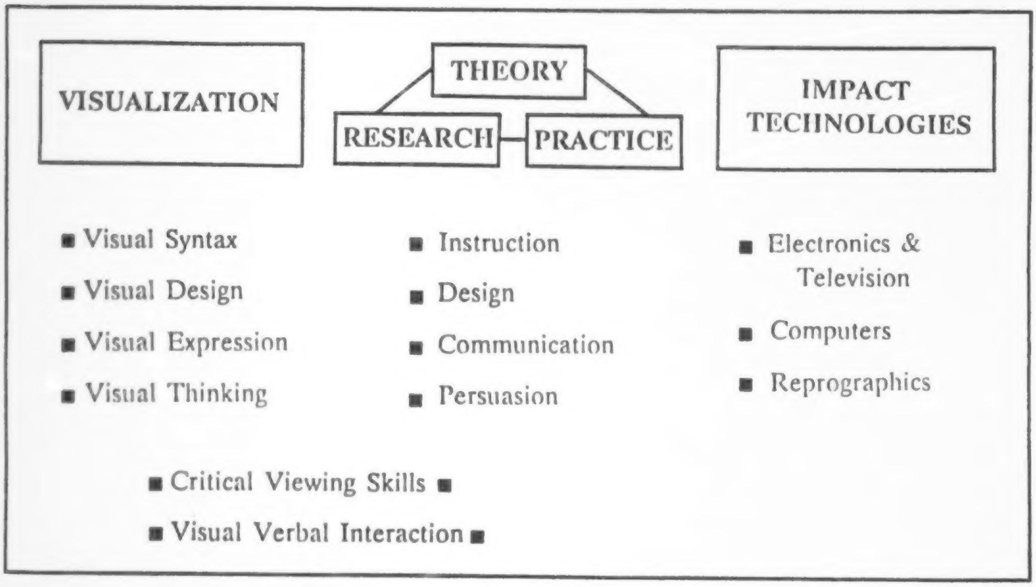

VISUALIZATION
THEORY
RESEARCH
PRACTICE
IMPACT TECHNOLOGIES
Visual Syntax
Visual Design
Visual Expression
Visual Thinking
Instruction
Design
Communication
Persuasion
Electronics & Television
Computers
Reprographics
Critical Viewing Skills
Visual Verbal Interaction

Fig. 4. Three Visual Literacy Domains (reprinted with permission)

experts in the field of visual literacy. The comments and statements made by these participants were analyzed to identify individual ideas which were proposed as being components of visual literacy. These ideas were combined to create a list of statements which was used as the instrument for the study. On successive iterations of the study, participants were asked to identify the extent to which they agreed that each statement identified an element of visual literacy. The responses were tallied and the mean response to each statement was used to determine the inclusion or exclusion of that element in the final list of constructs of visual literacy.

The results of the final round of the Delphi Study yielded 167 statements which were identified as constructs that define, describe, or elaborate upon visual literacy. This list of research-validated constructs is the first agreed upon set of parameters that define the field of visual literacy. As such it is a monumental milestone. However, this list should not be construed as being the final, definitive description of a complex and continually evolving field. As the field matures and more scholars contribute their knowledge and expertise, the elements will undoubtedly change. Constructs will almost certainly be added and possibly deleted. The existing list of constructs may well be pivotal in encouraging and organizing future scholarly efforts in the field. Certainly, as this paper will propose, the current list of validated constructs represent the best basis yet for structuring and visualizing the components of visual literacy.

The 167 statements which were accepted by the Delphi panel began as complex ideas offered by the participants. They were analyzed to create a series of statements containing individual, discrete elements in order to create an instrument that would allow the participants to agree to any number of elements without agreeing to them all. To achieve this, individual ideas were presented as sentence fragments beneath a stem item. For example, the comments about the purposes of visual literacy were placed on the instrument as follows:

Visual literacy refers to the use of visuals for the purposes of...
1) communication
2) thinking
3) learning
4) constructing meaning
5) creative expression
6) aesthetic enjoyment

Statements which supported or elaborated upon those broad constructs were presented later in the list. For example, those related to learning included comments which could be grouped into the two broad areas of educational goals and educational tools. These items were placed on the instrument as follows:

The aspect of visual literacy concerned with learning with visuals should include...
31) visual literacy as a goal of learning
32) using visual literacy constructs as educational tools

Related details for each of the preceding statements were presented in the same manner. An example of such a group of details is the statements which follow:

Visual literacy as a goal of learning includes...
33) developing critical viewing skills
34) developing critical thinking skills
35) developing the learner's ability to think

visually
36) developing the learner's ability to acquire information from visuals
37) developing the learner's ability to use visuals to construct meaning
38) developing the learner's ability to create visuals

Serendipitous effects-- The format described was born of necessity in response to the nearly overwhelming amount of written information received from the participants. The primary purpose of using that format was to make the list of statements as short as possible while still preserving the relationship between items. However, a couple of serendipitous effects were also noted. First, through the repeated occurrence of certain components in relation to more than one broader area, the intricately interwoven nature of visual literacy began to emerge. Second, a rather hierarchical structure for the constructs was created. Both of these findings are central to the appropriateness of choosing the 167 Delphi statements as the concepts used to create the Concept Map being proposed herein.

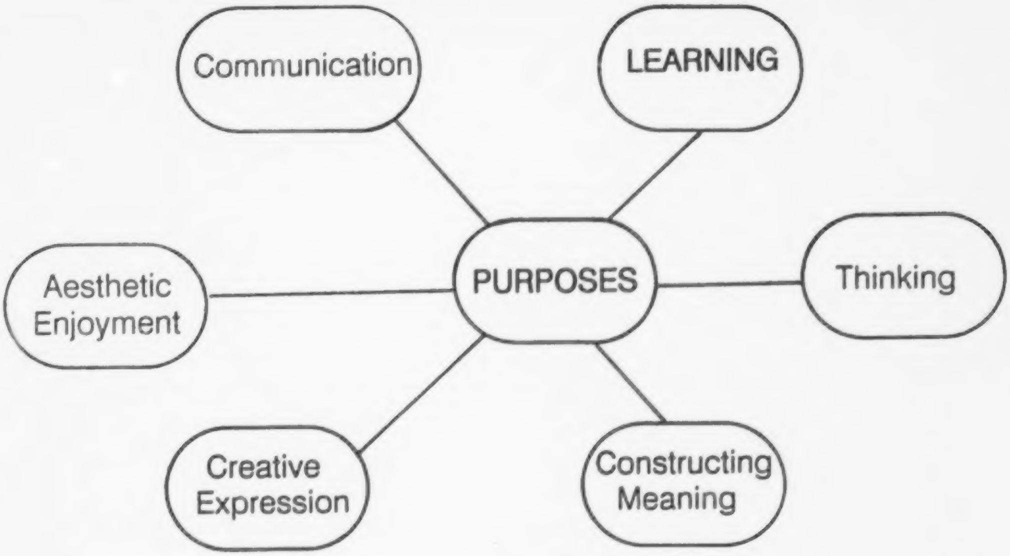
While the Delphi participants were not asked to judge the structure itself, no objections to it were raised during the two iterations in which the participants used the list of statements. This structure thus has passed a test of face validity with a large group of experts in the field. A strong assumption can be made, therefore, that this structure at least does not **misrepresent** the actual structure of the field, and it may very well closely approximate the ultimate reality.

Although the concepts and apparent hierarchial structure provide a framework for developing a Concept Map, the Clark-Baca results have limitations. The list of constructs is in the form of abbreviated statements and the concepts they represent is in no way described or elaborated upon. It reads more like an index to the field than a treatise on visual literacy. Moreover, even in its abbreviated form the list is unwieldy and needs to be made more concise so as to make the content more accessible. Unfortunately, any pressure to condense the list while simultaneously providing access to the literature which elaborates upon the concepts may represent conflicting needs.

Graphic Representation

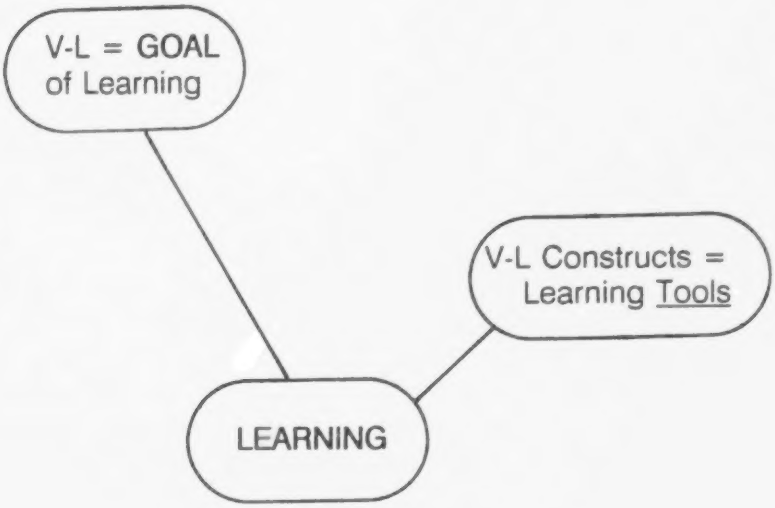
Many who have attempted to communicate the nature of visual literacy to others have resorted to communicating with gestures such as circles drawn in the air as they describe "broad areas." The complex nature of visual literacy may very well require such active kinesthetic and visual means of communication. Another viable method of communicating this grouping of elements might be the use of a visual such as a chart or graph. The authors propose a conceptual map which would serve as a graphic organizer of visual literacy constructs. Such a map would be a logical culmination of the work by many individuals over the past fifteen years--work that sought to structure the theoretical foundations of visual literacy and to visually display relationships of the components and practices of visual literacy. As proposed, such a map would be visually-encoded in the form of a series of graphs showing relationships. For the purpose of illustration, the concepts presented earlier (in the section entitled *Constructs of Visual Literacy*) are presented here in graphic form.

"Visual literacy includes the use of visuals for the purposes of..."

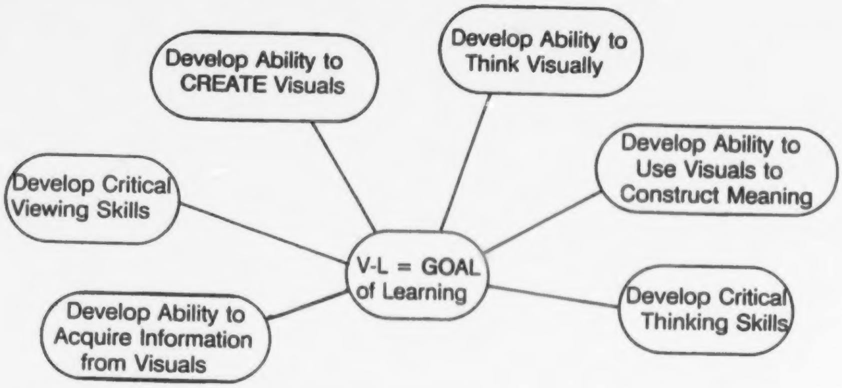

Communication
LEARNING
Aesthetic Enjoyment
PURPOSES
Thinking
Creative Expression
Constructing Meaning

Assume that the topic which is chosen for further investigation is *learning*. A second graphic would provide elaboration.

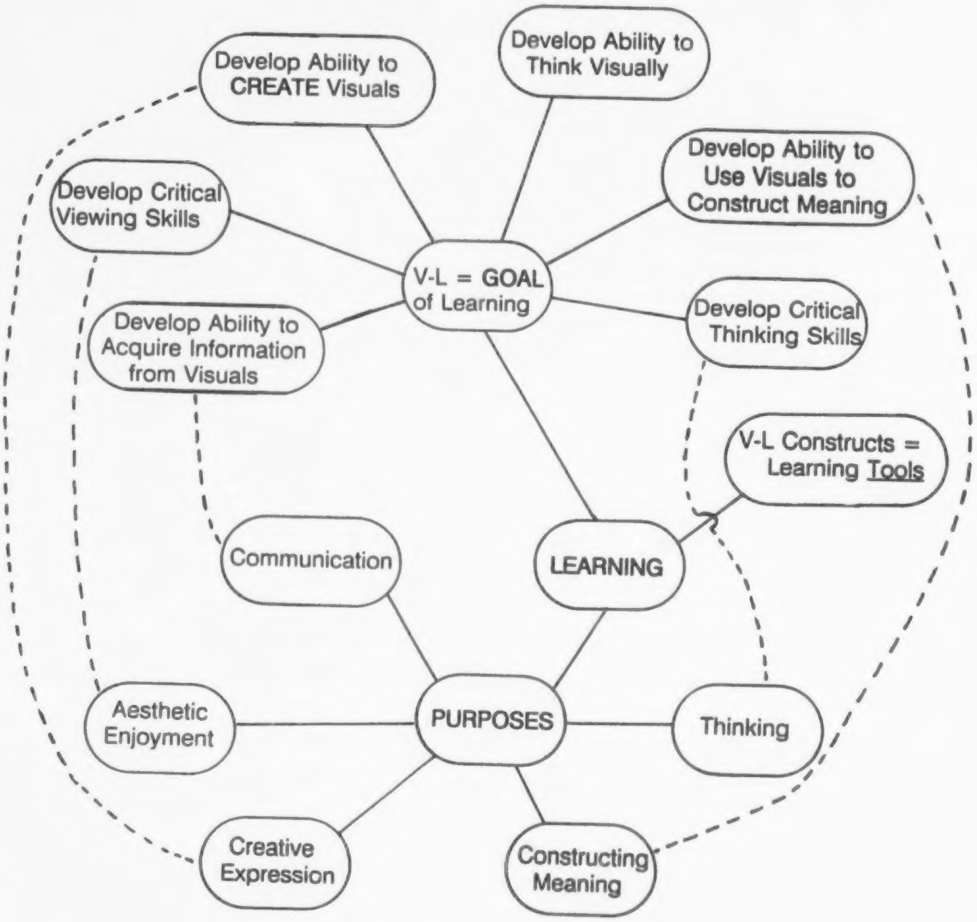
"The aspect of visual literacy concerned with learning with visuals should include..."


V-L = GOAL of Learning
V-L Constructs = Learning Tools
LEARNING

"Visual literacy as a GOAL of learning includes..."


V-L = GOAL of Learning
Develop Ability to CREATE Visuals
Develop Ability to Think Visually
Develop Ability to Use Visuals to Construct Meaning
Develop Critical Viewing Skills
Develop Critical Thinking Skills
Develop Ability to Acquire Information from Visuals

Once each small cluster of concepts is organized into a graphic pattern, then related clusters can be combined. When that is done, as in the example below, secondary relationships become "visible", and can be indicated by a visual code such as the dotted lines added here.


Develop Ability to CREATE Visuals
Develop Ability to Think Visually
Develop Ability to Use Visuals to Construct Meaning
Develop Critical Viewing Skills
V-L = GOAL of Learning
Develop Critical Thinking Skills
Develop Ability to Acquire Information from Visuals
V-L Constructs = Learning Tools
Communication
LEARNING
Aesthetic Enjoyment
PURPOSES
Thinking
Creative Expression
Constructing Meaning

Next, assume the user's interest is in *developing the learner's ability to create visuals*. Specific aspect of creating visuals were not included in any greater detail as constructs subordinate to *Learning as a purpose of visual literacy*; however, a related construct is *Creating a visual includes....* The user could then follow the path of concepts related to that construct.

Applications and Related Goals

Several possible applications of a conceptual map of visual literacy constructs are visualized by the authors. Such a graphic representation could provide a common organizational structure of the relationships between components of visual literacy. It might also provide a way of organizing the literature published in the field of visual literacy so that relevant scholarly works support the field and the concepts underlying it.

The interdependency of the three facets of visual literacy was an issue addressed by Griffin and Whiteside (1984). They asserted that theory should stimulate practical applications and that practical applications should be studied by researchers. They urged researchers and communications practitioners to engage in cooperative efforts and stated that the result would be that "the discipline of visual literacy will not only survive, but gain more credibility and stature among educators as a valid and necessary concept" (1984, p. 79).

The need to organize the literature presented by the authors as being specifically related to visual literacy as well as literature in other fields which support visual literacy constructs has been addressed by many scholars concerned with the field. Griffin & Whiteside (1984) identified three categories, labelled "theoretical," "visual language," and "presentational," into which they organized some of the literature of the field. Braden and Hortin noted the need for organization of the literature related to visual literacy (1982).

Several scholars have produced bibliographies of visual literacy literature in the last twenty years. Most of these have not been annotated and the content can only be surmised from the titles or discovered by reading each item. A database of the constructs addressed by each author would make it possible to identify that literature which is relevant to a specific area of visual literacy. Creating such a database, however, would be time- and labor-intensive and may or may not be feasible.

Methods of Achieving Goals

Two simultaneously existing but seemingly conflicting needs have been identified by the authors. First, there is a need to organize the identified constructs of visual literacy in such a way that presentation of them is simplified. A conceptual map has been proposed as a viable solution to that need. Second, there is a need to elaborate upon the identified constructs of visual literacy. The many aspects of visual literacy have been addressed from diverse points of views by the scholars who have contributed to the literature of the field. Making their expertise available through facilitating access to the literature related to each construct would be most beneficial to scholars and students alike.

A database of literature which has been identified as elaborating upon a construct is one solution.

The power of the computer for organizing, storing, and retrieving large amounts of information may provide a way of meeting both the needs identified herein. The use of a computer would be almost mandatory to deal with the volume of information required to access bibliographic references and to facilitate reference based on visual literacy constructs. The presentation power of the computer might also provide a means of creating and presenting the visual conceptual map and of integrating the two components.

Involvement of Visual Literacists Needed

The conceptual map which has been proposed here is not a simple graphic which can be produced by any one person. Just as the identification of constructs of visual literacy involved the knowledge and effort of many people, so will the development of a conceptual map and a database of related literature.

The graphic illustration of the interconnections between visual literacy concepts will be accomplished more easily if support is received from as many visual literacists as possible. If visual literacy scholars will identify the constructs dealt with in their research, applications, and/or study, the web will become more comprehensive, more complex, more elaborate, and the ideas will become more accessible to future scholars. The authors have an interest in spinning that web, and will welcome any correspondence or other input from interested persons as this project evolves.

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The Visual Rhetoric of Wilderness: Contemporary Environmentalism and the Depiction of Nature

Derek Bouse

Introduction

In this age of increased awareness about environmental degradation, it is difficult not to notice the extent to which we have visibly altered or despoiled much of the planet's surface, and the degree to which we have fouled and clouded the air that surrounds it. Yet, in spite of the physical destruction of the land, and the reduced visibility (not to mention health hazards) resulting from air pollution, there seems to be no shortage today of majestic, unspoiled, and still 'wild' land to see, no shortage of beautifully clear views of pristine areas of *wilderness* to look at -- in two dimensions, that is. The Arctic National Wildlife Refuge now appears destined to become littered with oil derricks, while the ancient forests of the Northwest are laid waste in clear-cuts of apocalyptic proportions, and most of the remaining open spaces around us are developed into condominium tracts and shopping malls; yet we can find two-dimensional visual images of beautiful, unspoiled, untouched natural landscapes almost everywhere. Though not as tacitly transparent as lexical/verbal language, these images have become woven into the fabric of modern existence, becoming part of its everyday lexicon and syntax. Indeed, there seem to be more of them than ever; they beckon to us from wall calendars, magazine covers, billboards, postcards, cereal boxes -- even beer cans.

Before we rush to pronounce this explosion of nature imagery simply a nostalgic yearning for what we've lost,[1] or a quasi-pantheist reverence for totems we've slain, or another modern-day substitution of *simulacra* for the real thing, or even a cynical marketing gimmick (all of which are true in varying degrees), I want to propose here a slightly different context in which to view these images, a different way of 'reading' them. However, rather than a close, *semiotic* analysis of selected views as 'texts' laden with immanent meaning, this is an attempt to reveal some of the visual traditions that lay behind many of the nature images we encounter today. It represents a program of ongoing research into the historical and cultural trajectory of certain ways of depicting nature, ways of responding to its visual pleasures -- *ways of seeing*, if you will -- and, more importantly, ways of acting and behaving toward our natural environment that come as a result.

The Currency of Images

The increased supply of nature images serves the environmental movement, and, in particular, efforts to preserve American's wilderness lands, in two ways. First, they help to promote and popularize wild natural places and objects in order to garner support for their protection. Second, and more interesting here, is the way in which they serve as visual substitutes for those places and objects -- which, of course, are in short supply, and would be destroyed if all who support and value them actually attempted to visit, or worse, to possess them. We can see here a general movement away from the real, and in the direction of the image, the ideal. Susan Sontag recalls a memorable quotation by Ludwig Feuerbach exemplifying precisely this, in THE ESSENCE OF CHRISTIANITY; he presciently observes, at the dawn of what might be called 'the photographic era,' that it "prefers the image to the thing, the copy to the original, the representation to the reality, appearance to being" -- to which Sontag adds, "while being aware of doing just that." She argues further that "a society becomes 'modern' when one of its chief activities is producing and consuming images" (1977, p. 153).

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[1] Susan Sontag (1977) writes that photographs "actively promote nostalgia," and are all, therefore, "*memento mori*." Photography itself, she argues further, is fundamentally "an elegaic art" (p. 9).

Yet there is by no means unanimous consent on Sontag's "widely agreed-on diagnosis." Eugene Hargrove, in his recent book on environmental ethics, sees the dynamic in the mid-19th century, the precise time of which Feuerbach wrote, as moving in precisely the opposite direction, i.e. from the imaginary to the real. Indeed, contemporary concern for *real* natural environments, Hargrove argues, emerged from an interest in the depiction of nature in images, that is, in *Art*. He writes,

> In painting, there was a movement from the appreciation of composed paintings representing *imaginary* places to an appreciation of paintings representing *real* places, and finally to an appreciation of natural *landscapes resembling picturesque paintings*... the movement was from the ideal to the actual or real, from the general or the universal to the particular or individual, and from the artificial to the natural in such a way that aesthetic appreciation became focused on natural objects and living organisms as objects of interest *for their own sake* (pp. 122-23; emphasis added).

He adds later that, "paintings that represented real places came to be preferred over the ones that were ideal, *and the places depicted came to be preferred over paintings of them*" (1989, p. 171, emphasis added). It was this important move from valuing *representations* of the land to valuing the *land itself* that constituted the fundamental dynamic in the emergence of much of American (popular) environmentalism -- especially as regards preservation of *wilderness.*

In this century, however, the tendency in nature depiction does indeed appear to have swung in the other direction, i.e. back toward preference for images -- though images of recognizable and real, rather than an imaginary, places. Environmental organizations use these images today to provide us with what Sontag calls an "imaginary possession" of that which we cannot actually have (1977, p. 9).[2] As Dean MacCannell has noted, "the entire structure of everyday reality in the modern world depends on the perpetuation of authentic [objects] which themselves are not for sale" (1989, p. 158).

Environmental organization like the Wilderness Society, the Sierra Club, and the Nature Conservancy, use visual images to foster pro-wilderness sentiment, to raise money for wilderness protection by attaching *cultural value* to it, in essence creating a *demand* for wilderness -- but of a sort which can be met at once by those same two-dimensional images of it. Thus, in place of creating an actual demand for real wilderness, they promote instead a *pseudo-demand* which can be satisfied with visual images. This demand is, in effect, a form of *desire* which is displaced onto substitutive objects rather than actually fulfilled.[3] Thus, only by a careful and delicately balanced use of visual images do environmental organizations sustain the demand and desire for wilderness, and allow it to be preserved rather than consumed. MacCannell describes this situation as one in which "an individual seeks to identify himself with a sight by sacralising one of its markers." He adds that "this is best represented by the use of travel posters," which function as "displaced replicas or effigies of the sight they mark" (1989, p. 124).

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[2] Though Sontag uses the term only in relation to *photographic* images, it applies as well to images in other media.

The substitution effect which results might also be likened to the signifying relationship between federal reserve notes and the gold supply which, theoretically, sustains their value. Today we happily accept paper currency as a *permanent* substitute for a gold supply we will never see, but which is maintained to give our bills meaning, to act as their *signified*. Printing dollars for which there is no corresponding supply of gold, so the theory goes, makes our bills worthless, signifying nothing. Originally, of course, the idea was that federal reserve notes signified gold for which they could still be redeemed. The images in the annual Sierra Club Wilderness Calendar, for example, are also valued for their signifying relationship to real, existing places. They serve as 'tokens' which can be 'redeemed' if we choose to visit the place, or have the experience they depict. Of course, it is essential that few, if any of us, ever do so choose. This is precisely what allows these places to remain intact, to function as a source of more beautiful images, and to lend continued signifying value to images already in circulation. Hargrove explains that the experience of viewing photographic representations and reproductions of natural places is a valued aesthetic experience mainly because of "the knowledge that the original still exists." This experience becomes untenable, however, when the object itself "has been destroyed or so damaged that it is no longer aesthetically pleasing" (1989, p. 170).

The Landscape Tradition

When we look at nature images themselves, at those which are so widely used by advertisers and promoters, as well as by environmental organizations, what we see is the convergence and/or culmination of certain collective assumptions we, as a culture, have come to share regarding nature. As indicated above, these attitudes are embodied, to a large extent, in the aesthetic traditions of American landscape depiction, both in painting and photography. There they have become ritualized in visual formulas, formal conventions, and codes of representation. These traditions survive today not only in the hundred-year-old canvases and prints that hang in museums and galleries, but in the work of contemporary artists whose widely reproduced images are seen today by more viewers than ever. They also survive in the *filmic* portrayal of nature we find in movies and on television -- though these have been granted little accord as media for landscape expression. Yet, Pare Lorentz's 1930s documentary films THE PLOW THAT BROKE THE PLAINS and THE RIVER, stand today as examples of attempts to adapt moving images to landscape aesthetics. While they dramatized the need for conservation of American lands, their conspicuous lack of visible human presence rendered them virtual, if not intentional, *filmic landscapes*.[4]

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[3] As such, this relationship might also be said to possess the characteristics of a *fetish*, which Freud describes as "a compromise formed with the aid of a displacement" (1969, p. 60).

Environmental organizations today make extensive use of all of these visual media in their campaigns to protect nature and preserve American wilderness. By such visual means we acquire most of our 'knowledge' about wild nature, as well as a visual familiarity with remote, rarely seen, and previously unknown places in it. Just as often, however, producers will rely on images with which we are already quite familiar, which depict well-known places, scenes, objects, and views (the 'classic' views of the Yosemite Valley, the Teton range, or the Grand Canyon, for example).[5] In many cases they also take advantage of our acquaintance with the work of specific *image makers*. The photographs of Ansel Adams, for example, remain favorites in attempts to raise concern for the environment; they are often 'quoted,' imitated, or used directly in other works promoting the cause of environmental preservation (though Adams himself denied ever having made a photograph with such intentions[6]). The landscape tradition thus provides an interpretive context or frame for images of nature we encounter outside of acknowledged domains of 'Art' (though the latter was where Adams preferred his work to remain).

Nature as Visual Entity

Landscape aesthetics have also done much to shape the ways in which we 'package' and 'consume' nature itself, perhaps fundamentally altering the way we experience and interact with it. In some places, American wilderness lands have been redefined as 'parks,' and thus institutionally reorganized as 'scenery.' As such, they are managed to provide primarily visual experiences.[7] Many of our beloved National Parks, where millions of Americans go to explore, to commune with, or just to behold unspoiled wilderness, have in fact been selected, laid out, and organized in accordance with conventional visual preferences growing out of landscape aesthetics. Alfred Runte, in his excellent cultural history of the parks (1989), describes the ideology of "scenic monumentalism" which, for many years, was the guiding principle behind the selection and organization of the parks. One need only envision a Bierstadt painting to understand the workings of this idea, and to recognize the culturally satisfying intelligibility it imposes upon nature, allowing it to be 'read' according to conventional form.

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[4] Thomas Chalmers's stentorian narration of these films does little to detract from their powerful visual images of the American landscape. In 1958 Walt Disney produced THE GRAND CANYON, a film with no narration, set instead only to the music of Ferde Groffe's GRAND CANYON SUITE. It is perhaps the earliest example of the sort of 'landscape film' now found in popular 'travel videos.'

[5] The fact that much of the information we have about the Natural world comes to us by visual means, and that we rely heavily on our ability to recall and recognise so many visual images, reveals the striking, and fundamental inadequacy of recent attempts to define Americans' "cultural literacy" purely in lexical/verbal terms, or to restrict it to a written list of names, phrases, dates, and concepts *without pictures* (see, for example, Hirsch, 1988).

[6] In his autobiography, Adams writes, "People are surprised when say that I never intentionally made a creative photograph that related directly to an environmental issue, though I am greatly pleased when a picture I have made becomes useful to an important cause" (1985, p. 1)

[7] Shafer and Brush (1977), in research to measure preferences for photographs of natural landscapes, recommend that policy and decision makers "manage natural landscapes for an optimum range of scenic preferences" (p. 237). They go on to recommend that lakes be created, and that areas of forest cover be cleared to enhance scenic values. Arthur, Daniel, and Boster (1977) also conclude that "extensive 'natural' areas often become monotonous," and that "in some cases harvesting has increased the scenic value of a forest" (p. 112). Both of these amazing arguments for the aesthetics of the *clear-cut* were, not surprisingly, funded by the U.S. Department of Agriculture, the bureaucratic home of the Forest Service. It is the Forest Service's job, of course, to sell the National Forests to logging and lumber companies for harvest.

The patriotic mission of preserving America's grand, monumental scenery resulted, however, in park boundaries that were drawn not only to enshrine and preserve, but to mark-off and 'frame,' only those areas containing the most spectacular and unusual natural objects, and the most breathtaking vistas. Other factors, like bio-diversity, wildlife habitat, and the overall ecological balance in those areas, were often flagrantly ignored or intentionally upset.[8] Despite a relatively recent emphasis on recreation in the parks, and the addition of several which boast no spectacular 'monuments' or views (e.g. the Everglades), the purpose of the parks has remained, for the most part, to act as *scenic preserves*, as repositories for America's sacred 'crown jewels.'

Whether the cherished antiquities contained in them are considered 'jewels' or 'monuments,' the National Parks have clearly taken on the job, and much of the character, of museums. Though they are often referred to as 'outdoor museums of *natural history*,' the parks are closer in style to the model of the *art museum*.[9] This is evident in their internal organization around a series of discrete 'sights' and 'scenes,' in the methodical layout of the roads which demand that these to be viewed in a linear sequence, and in the emphasis on picture-taking and visual experience at each of these points. Visitors are thus guided through an orderly series of 'scenic turnouts' and viewpoints, pausing regularly to behold pre-selected, well composed, and carefully 'framed' views. Like images in a picture book, many of these even come with their own 'captions' inscribed on plaques and signboards.[10]

Landscape and scenery assessors acknowledge that, "managers can guide observer position, distance, and elevation by placement of roads and trails and by directing visitors to scenic viewpoints; they can manipulate 'sequence' by planning trails." Forced to admit that some adventurous visitors will seek out their own views, they add, "hikers will sometimes leave the planned trails, or view an area from a less than 'optimal' viewpoint (see Arthur, et al, 1977, p. 14). The key words here are "less than optimal viewpoint;" in this we see clearly that "managers" do indeed know what are 'optimal' viewpoints, where to find them, and how to make sure that we see them. By such means, 'travel' and 'adventure' have become institutionalized and administered as 'scenic tourism' or 'sight-seeing,' and reduced to a kind of rule-bound spectator sport. With the tremendous growth of the 'tourist industry,' however, we must admit that it is, at bottom, a consumer activity in which the basic unit of tourism, the scenic view, the 'sight,' has become another marketable commodity.

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[8] Indeed, in Yellowstone, for example, there went into effect a systematic attempt to exterminate wolves in order to provide more of the 'beautiful' or 'scenic' species, like deer and elk, for park visitors to look at. This attempt to create unnaturally high ungulate populations resulted, obviously, in a profound imbalance in the centuries-old predator/prey relationships. For further rumination on the subject, see Alston Chase's PLAYING GOD IN YELLOWSTONE (1989).

[9] For discussions of the reconceptualisation of nature as a visual or 'scenic' experience, see: Jackson (1984), Jakle (1987), Shepard (1967), and Hunter (1985); on the issue of scenic tourism specifically, see: MacCannell (1989), Wilson (1988), Schmitt (1990), Sears (1990), or John Taylor's review of Sears in THE NATION, February 26, 1990, pp. 287-88.

[10] MacCannell calls these "markers," and includes among them guidebooks, slideshows, etc. The process of moving from sight to sight he describes as "ceremonial agendas involving long strings of obligatory rites" (1989, p. 43).

One factor helping to influence the marketing of scenery, as well as its consumption, or interpretation, by viewers, is the way in which many official sights and views have been selected for the way in which they correspond directly to familiar perspectives found in famous 19th century works of landscape art (e.g. Thomas Moran's view of the Grand Canyon of the Yellowstone, Carleton Watkins's "best general view" of the Yosemite Valley, etc.). In his book on photographer William Henry Jackson, Peter Hales writes that:

> the photographer judged, praised, and even *landscaped* the scenery by choice of vantage points, judiciously delegating the portions of the [tourist's] route that deserved attention and then explaining precisely what form of attention they deserved. Thereby, the pictures became not only artifacts of taste, but *instructions in taste*, in *how the tourist should see* the scenery (1988, p. 146 -- emphasis in original).

Similarly, John Jakle notes that:

> contrived tourist attractions are designed to be viewed from controlled vantage points. Cameras dominate visual experiencing when tourists seek to *replicate popular photographic views* of a place... (1987, pp. 116-17 -- emphasis mine).

Even at scenic points for which there are no 19th century images to serve as models, the officially selected views have become nearly sacrosanct through countless contemporary photographic replications.[11] Daniel Boorstin has argued that tourists generally "go to see what they know is already there," or perhaps, "not to see at all, but only to take pictures" (1962, pp. 116, 117). Not surprisingly, the approach to a scenic view in a national park is indicated by a sign featuring an easily recognizable icon of a camera. Each such stop is thus clearly intended to promote *photographic seeing*, yet by providing a compositional prescription for tourist snapshots the scenic views also determine the way in which thousands more will subsequently see wild nature. Moreover, unlike the federal wilderness areas, the prescribed, pre-packaged, and primarily visual experience offered in the parks has effectively fragmented them into discrete 'sights' and tourist 'attractions.' These influence and organize the views motorists will have of the landscape, according to John Jakle, "whether or not they avail themselves of the opportunity to stop" (1987, p. 67).

Positive/Negative

Clearly, the national parks are designed to reveal the beauty of nature, to display pleasing sights, and to provide 'positive' visual experiences. Though several of the parks do contain regions which have sustained fires, floods, or blight, the landscape tradition accommodates these under the rubrics of the 'picturesque' and the 'sublime.' Picturesque scenery presents nature not as gentle and pastoral, but as rough, irregular, and asymmetrical -- in a word, as a *wilderness*. In it, as Joel Snyder explains, "decayed natural objects are contrasted with a robust, flourishing nature." He points out, moreover, that "nineteenth-century landscape particularly stressed the joining of the picturesque to the sublime" (1982, p. 42). Perhaps not coincidentally, it was during this time also that theories of 'catastrophic geology' were becoming popular, which had an effect not only on the accepted definition of 'nature,' but on what constituted 'natural beauty,' as well. Rugged mountain scenery, for example, which had for centuries been regarded as terrifying and hideous, became highly regarded thanks to the concept of the 'sublime,' the doctrine of terrestrial catastrophe, and intense curiosity in America about the Rocky Mountains. Nineteenth century notions of what were 'negative' images were softened, as these were seen to grow out of the same cultural soil and tradition as the 'positive.' With ideological foundations thus in place, the way was clear for a conceptual integration of inviting, picturesque scenery with a sublime landscape revealing the scars of terrible and destructive natural (or *supernatural*) powers. From this emerged a complex aesthetic which could accommodate and find beauty in nearly any natural cataclysm in the national parks (though, as the recent fires in Yellowstone and Yosemite have demonstrated, there are limits as to what is acceptable, even from nature [12]).

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[11] St. Mary's Lake, in Glacier Park, Montana, said to be the 'most photographed lake in North America,' is a prime example of this. Though I suspect there are few who have not seen the 'classic view' from its west end, I have never seen a 19th century rendering of it.

Apart from the metaphysical terrors suggested by the sublime, there has been another kind of 'negative' image of nature which has found increasing expression in this century, and especially in the last decade. This, of course, is the depiction of nature revealing careless or wanton destruction by humans. Thomas Cole's famous five-painting series "The Course of Empire" (1836) begins with an uninhabited landscape, proceeds through a pastoral stage of human settlement, culminates with a civilization in triumph, then portrays its decline and fall; the final painting depicts nature re-asserting itself, reclaiming the earth after ephemeral human presence; civilization has left few, if any scars upon the land. A generation later, however, Sanford Gifford's painting TWILIGHT ON HUNTER MOUNTAIN (1861) depicts a plowed and stump-strewn forest clearing, reflecting in miniature the devastation which was already being inflicted by the 'axe of civilization' and its concomitant, the plough. This painting anticipates a contemporary image which we see more and more often: that of the massive forest clear-cut -- reflecting the now industrialised devastation inflicted by the chainsaw and its concomitant, the bulldozer.

Today, the battles over the natural environment waged in the visual media (especially in film and video), are fought using strategies of persuasion involving powerful combinations of positive and negative images. Beautiful, pristine landscapes are juxtaposed against images of devastation, sometimes displayed side-by-side, sometimes combined in *Eisensteinian* 'associative montages.' This new syntax of images may succeed in fundamentally altering the way we read and interpret traditional, 'positive' (i.e. beautiful) landscapes. With nearly every aspect of our natural environment now widely understood to be in severe danger, such images may soon no longer need their negative counterparts as reminders of what can happen. The realization today that it is happening already suggests that even the most pleasing images of nature can be read as containing their opposites, their own 'negatives,' if only in the form of unseen potential for destruction.

Indeed, the viewing public is cinematically literate enough to be aware of dangers lurking off-screen in a dramatic movie; if traditional rules of landscape composition (i.e. 'closed' form) are abandoned in the move toward more dynamic motion picture images of landscapes, the mere use of 'open' cinematic form to depict landscape may provoke an unsettling awareness of the tenuous existence of the place, as if destruction (i.e. 'progress') lurks just beyond what is visible. The threats would no longer need to be seen, or even present, to be felt. Scenes of ancient forests in the Northwest, for example, may come to signify not only their beauty, majesty, and antiquity, but also the looming possibility of their destruction. We may no longer read a photograph of a giant sequoia or redwood, whether it was made a hundred years ago or just last week, as 'big tree,' or even as 'rare tree,' but now as '*endangered* tree.' It is this sort double-coding, or split-level signification, that John Nichols invokes in his assertion that every landscape photograph today "is a voice raised in protest, as well as a hosanna for the planet" (1989, p. 45).

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[12] Conrad Smith (1989) has studied the media's treatment of the Yellowstone fires, especially the way in which selected visual images are used to represent the entire complex of natural forces involved (biological, botannical, meteorological, etc.).

Environmentalists who use visual media today are by no means in agreement on the use, or even the possible meanings of positive and negative images. The Wilderness Society, for example, has produced films which call attention to the wholesale destruction of forests by making extensive use of negative images depicting massive clear-cuts (often photographed from the air). Wildlife filmmaker Marty Stouffer, by contrast, who describes himself and his films as being strongly committed to *preservationist* ideals, maintains a commitment to avoiding negative images. In his book WILD AMERICA (1988), he describes his strategy for making films which would help to preserve wildlife by exclusive use of 'positive' imagery:

> we decided that we would do what we always try to do -- focus visually on the wildlife itself, on its beauty and grace, and try to tell the management story in a softer, more general way. Above all, we wanted the program to be very positive (p. 270).

We can see in this an outline for a theory of visual persuasion which could be applied to wilderness as easily as to wildlife. In it lies the assumption that "very positive" images are enough in themselves to engender sympathy for an endangered species or wilderness, and to mobilize the public in support of its preservation. Voicing almost precisely the same ideas about visual persuasion as Stouffer is filmmaker Alan Root. Noted paleontologist Richard Leakey has said that Root's films

> have provided a very powerful message. They are so *beautiful* and so well-done that although there is *no explicit statement*, the implied message is that *'this has to be preserved'* (see McCrae, 1989, p. 31, emphasis added).

Root himself clarifies his position, and gives perhaps the clearest statement of the theory of visual persuasion based exclusively on positive images. He explains:

> If you show something that's magnificent, then its superfluous to preach to people about what a loss it would be if it disappeared. If they don't already feel that way anyway, then it's pretty hopeless (in McCrae, 1989, p. 34).

Though other filmmakers question, if not altogether reject, the value and effectiveness of the Stouffer/Root approach to visual persuasion, it is important to remember that what is deliberately intended as a 'negative' image in one film or photograph may still be used as a 'positive' image in another (depending on the political inclinations of the producer), and that a 'positive' image may contain its own 'negative.' Moreover, if 'positive' images of conventionally beautiful scenery remain the norm, the standard against which all scenery is measured, then every 'negative' image automatically refers back to some 'positive' archetype in order to be understood. The image of the clear-cut forest may be read by some as a natural meadow, but most will recognize it as the image of a missing forest, a forest conspicuous by its absence, thus employing the mental image of a forest as the 'ground' against which to read the clear-cut as a 'figure.'

Still, the preservationist's vision of apocalypse may be the developer's ideal of progress and enlightenment.[13] Images of the chainsaw, the bulldozer, the falling tree, the flooded canyon, the clear-cut forest, and so forth, are likely read by comparison to other images, but should also be read in relation to the ideological agenda of their creator or producing organization -- though they rarely are.[14] The question is not, however, one of what visuals are intended by their creators to mean, but one of how they're read, and what they mean to viewers.[15] But even more important is the question of what we will do in response, and how we will act upon our environment as a result of what we learn.

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[13] Of course, the classic example of the relativity of visual images, and of the possibility for reversing their meaning, is the case of images from Leni Riefenstahl's TRIUMPH OF THE WILL being appropriated by Frank Capra in the "Why We Fight" film series; when recontextualized and shown to a different audience, they were read not as paeans to Nazi glory, but as revelations of Nazi excess, obsession, and lust for power. Thus, they became an effective propaganda tool for the opposing side.

[14] There has been little research into the guiding ideologies behind environmental organisations. The September, 1990, edition of OUTSIDE magazine features revealing profiles of 25 leading American-based environmental organisations, based on research by Bill Gifford. It is a good start in sorting out and clarifying the widely differing agendas and priorities of these groups.

[15] For now, the only measures environmental organisations have for gauging the effectiveness of their campaigns using visual images are their expanding membership numbers.

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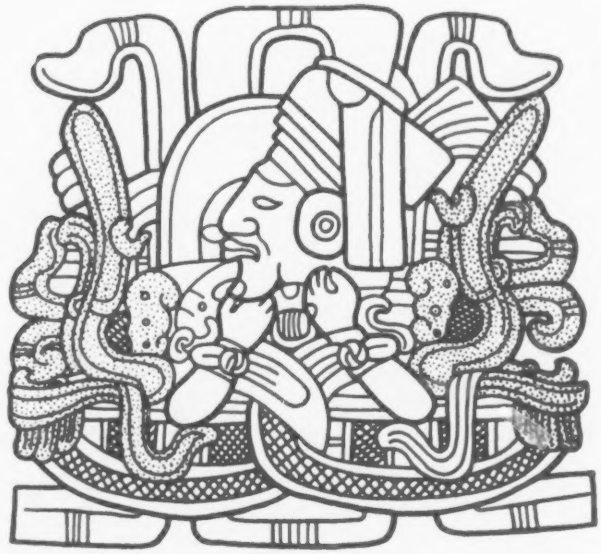
The Mosaic:
A Visual and International Approach to International Design

David G. Gueulette



This report supports a slide presentation that suggests a unique approach to applying instructional design theory and practice to an actual course development activity that took place in Copan, Honduras in the Spring of 1987. The task centered on the creation of a course for undergraduate and graduate students in Anthropology at Northern Illinois University that would provide site-specific introductory instruction for subsequent field experiences in Maya excavations and reconstructions.

Early in the planning for course design and development, our small development team, with help from anthropologists at N.I.U., decided to try a novel idea: with materials and resources on the site in Copan we would analyze the intended audience, build objectives, consider media support, plan testing and organize an evaluation scheme for the course using the concept or theme of the "mosaic" as a visual metaphor.

While deciding how we should implement an instructional design model for a course on the Archaeology of the Maya at Copan, and reviewing background materials on the Maya, we were struck with the highly visual and mosaic character of Maya art, architecture and even lifestyle. This discovery, coupled with our notion that typical I.D. models suggest visualizing instructional problem solving, we shaped a concept that related I.D. to a "mosaic". In other words, our course design approach would be put together in pieces, on the spot with much attention to the visual character of the subject matter and the intended subsequent learning.

In the process of reviewing instructional design literature, we could find no violation in either the intent or practice of I.D. using the mosaic approach. It would not only be possible to create the typical results of traditional systematic design of instruction but it might also be possible to address some of the usual concerns of critics of I.D. That is, we might be able to be more spontaneous, less menu driven, more in touch with the subject, more creative, and possibly more humane.

Additionally, we were interested in adding in a substantial local factor in the design of the course. The Maya developed a very rich culture that was not only highly visual in its outward symbols of power and tradition, but even today continues to influence the modern Honduran inhabitants of the area. The locals of the Copan area still exhibit some of the cultural traits of their ancient predecessors. There are still remnants of the Mayan language in the local dialect and, in fact, some of the people of the area still speak ancient Mayan. Crafts reflect the Maya culture as do foods and dress, music and dance.

It became important to us to incorporate as much of the current Honduran culture in the design of the course as possible. A major goal of the course was to use current and contemporary artifacts of the culture as an extension of the on-going nature of the Maya world, and thus to demonstrate to students of that culture the continuing dynamics of tradition, values and customs.

We also wanted to involve the local Hondurans in the design of the course as they would play a large role in the eventual delivery of the on-site portion of the program. They are actually instrumental in uncovering Copan as they are the experienced workers at the site along with national anthropologists provided by the Honduran government.

It was also recommended that the locals have access to all the materials and related content items of the course as they have, as caretakers of the ancient Maya culture, a vested interest in all that pertains to the uncovering and exploitation of the culture. In other words, for a number of reasons, it made good sense to involve all local Copanecs in as much of the course development as they wished.

We used 35mm slides to document the entire design and development process using the "mosaic" approach. We attempted to capture with visuals the salient aspects of the activity with the intention of using the visual record to support or supplement the evaluation of this novel I.D.; and, to be in a position, as we are now, to report the application.

Using media such as video and slides also seemed a most appropriate way to record a most visual anthropological and metaphorical approach to instructional design. It was a good choice for capturing the moment, the culture and the development process. It has also been a very powerful means of reviewing and explaining the development process: the "mosaic" to all who are interested in alternative ways to use I.D. and to those who are concerned with developing instruction that is very international and participatory in scope.

This is a good example of collective and international design and development of instruction and may serve as a model for others who wish to become involved in similar instructional approaches. We have determined that this intercultural design of instruction combines good theory and practice. It suggests a global perception of instructional problem solving, attention to multicultural learning themes, and a diminishment of monopolies of educational expertise.

Copan

The following narration tells of our attempt to use the "mosaic" as an instructional design approach on site and in process using a multicultural team of educators at the Maya city of Copan in Honduras.

Copan, today, is a sleepy little town in the mountains of North Central Honduras, and a most unlikely site for the ruins of a major Maya settlement. It also seems a most unlikely site for an instructional technology doctoral student and an I.T. professor to be involved in course development. But, so it was that in the Spring of 1987, Rich Casey and I found ourselves engaged in a remarkable culture and an equally remarkable task.

Rich had been a student in the Instructional Technology Doctoral Program as well as a graduate assistant in the Department of Anthropology at Northern Illinois University. In his role as G.A. and as a former student in the Department of Anthropology, he had discovered the need for an introductory course in field techniques for students who might find themselves on a dig or at a reconstruction site. In fact, Northern was sending undergraduate and graduate students to Copan for field experiences with little prior preparation for actual on-site activities.

Coupled with this perceived need for a course in field techniques, Rich had been trying to take an I.T. course in instructional design. As luck would have it, he was being assigned to the Copan Project at the exact moment he would be needing the I.D. course. The solution seemed evident. He could try out instructional design on the Anthropology Field Experience Course at the actual site. And, as it turned out, Dr. William Fash, the Director of the Copan Projects welcomed the course development exercise for what it might generate for his own students. Additionally, as a part of the course development package, Fash would have access to materials, 35 mm slides, and most importantly, a videotape record of field experiences on the site at Copan. During our Spring Break that year, I had the time to join Rich in Honduras and supervise the academic side of the project. So, serendipity, more than planning, provided the context in which unique course design and development could take place. For my part, I was also anxious to see the rich Maya culture, visit Central America, and to test the efficacy of designing courses in the field without a concrete I.D. approach in hand.

Perhaps the best way of reporting on the course design and development process in Copan and its eventual results, is to provide a script that conveys the details of that exciting time. The script goes along with a set of slides that were culled from the 720 slides that were taken to document the I.D. activity and to provide visual materials for the field experience course.

At the very start, modern-day Copan colored the view of our task. There is evidence of the Maya culture in todays Copan... in fact in some respects little has changed from the lifestyle of Copanecs of the 8th Century to that of the 20th. One sees food dress and customs that continue these 1200 years.

Not far from present day Copan is the ancient city which has been only recently uncovered. Dr. William Fash of the Anthropology Department at Northern Illinois University, DeKalb, Illinois has been the director of a National Science Foundation grant to uncover and reconstruct the ancient ruins. Some of the original work on the site was initiated in the 19th Century, but most of the unearthing of Copan has been a product of very recent efforts.

The site, once massive, is now covered with vines and difficult to envision in its original splendor. Several very large pyramids are the primary vestiges of the old Maya capital city, and all but overwhelm the visitor. They are high, perhaps 100 feet, and most laborious to climb.

In March of 1987, Rich Casey, doctoral student in I.T. at Northern and Dave Gueulette, I.T. faculty member, began the design and development of a course of study on field experiences in anthropology at Copan.

Not having a prescribed instructional design for the development of the course, we decided to initiate course construction as a dynamic or heuristic process that would produce the curriculum, instructional methods and materials as a outcome of being directly engaged with potential students, the site, available related texts on the Maya and Copan, and other rich sources in the environment.

We started by going over the texts on the Maya that were being used to teach related courses at Northern and tied the texts to actual artifacts on location. It was quickly obvious that the texts and the objects elicited a highly visual connection.

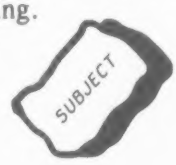
Connecting text visuals with artifacts, we began to put together the most important aspects of both. We examined these exciting remnants of a long past culture and related these to the text and possible course objectives. We also noted the process for unearthing these symbols of royal and common Maya culture.

Struck by the visual impact of the site and the artifacts and the highly mosaic quality of both, we started to think of the course development process as the uncovering or piecing together of a mosaic ... finding diverse but connected pieces and putting them together to create a pattern that conveys a message or instruction.

The I.D. process thus took on the aspects of connecting together a mosaic... the pieces being... the field, the site, the workers, the town itself, the students on the project, texts, authorities on the Maya (content experts) also on site, and the local Maya museum.

We took in the field and site immediately to find what it could suggest for the course and made videotapes and slides of the location and the process of finding, mapping and classifying finds. We talked to the workers, some of whom were locals and descendants of the ancient Maya, and some of whom were current anthropology graduate students.

The National Science Foundation Project, as it happened, was titled: "THE COPAN MOSAICS PROJECT" and rightly so as much of the work of the project involved piecing together scattered stone to form a visual of the Maya culture. Thus, the concept and visual metaphor of "mosaic" became the emblem and theme of the process we were shaping.



Continuing interaction with the connection of the parts of the mosaic was helpful in cementing the pieces of the environment together to get a fix on the field experience course. We also had the luxury of being able to consult with one of the teachers who could use the course and who was also an anthropologist and authority on the course's primary focus: the Maya.

Local workers know a lot about the site, the ancient Maya, and the process of uncovering and documenting the findings. Much of the work of documenting and classifying finds is an art/visual process that requires sketching, drafting and painting.

Visits to the local Maya museum also were helpful in building ideas on the content and on the use of museums in general in the course. The town and inhabitants provided aspects of the course as they suggested a connection of the past to the present and the role of these influences on field experiences.

The videotape and slides of the process assisted continuous visualization of the I.D. as mosaic and prompted us to be ever reflective; thus, allowing us to keep course development in perspective. It also offered a visual record that could be used to document the process and to permit on-site interaction and evaluation. In sum, we were engaged in a venture that became highly reflective and very interactive. The ever-present video record kept the mosaic from falling apart.

While in the process of building the mosaic I.D. a major find occurred. Beneath a primary pyramid a cache was discovered with very interesting and revealing artifacts on the death rituals of the Maya royalty of the Classical Period. News of the discovery went worldwide and brought immediate international attention to the Copan Mosaic Project, and visits from several prominent scholars.

The artifacts were outstanding and served to remind us of the role of visuals as totems, signs and symbols of traditional and modern cultures. Their visual records on carved stone and flint are not so unlike our own current messages on paper and film. The message on a carved chest piece or stela of ancient Copan could be identical to a modern billboard or television commercial, "do this" or "don't do that."

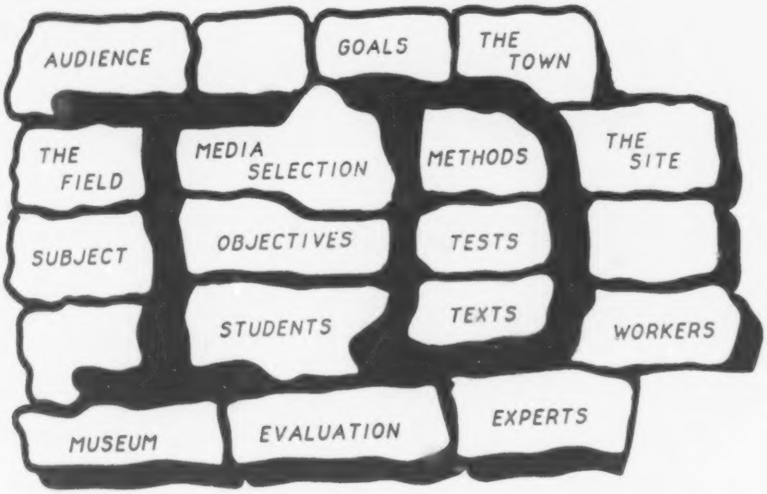
The newly found artifacts also reflected a perspective on the role art played in Maya life. These findings were consistent with the pictures of similar finds as published in the anthropology texts we were consulting.

A visit to the digging of the tomb presented certain problems ... video and slides were hard to take. Moisture, poor lighting and falling dirt compounded to cause difficulties recording the discovery activities; and, the heat, perilous trek into the tunnel and claustrophobia made a great adventure. The trip, nevertheless, was crucial to documenting the field experience and the visit to the tunnel proved well worth the cost. In fact, in an earlier videotaping session, Rich was able to record the actual finding and removing of one of the most significant artifacts. This, an important record of the find and a piece of video that graphically shows the care required of anthropologists in their field duties, was in great demand by visiting scholars and now remains a seminal visual account of recovering major artifacts. What a valuable instructional medium for showing actual recovery techniques this is.

It was especially advantageous to be in touch with an authority on the Maya and a possible future user of the course as we moved through the I.D. process. The agreement on objectives, tests, media and materials and course evaluation was greatly facilitated.

The scene was rich with content experts, potential learners and teachers and an almost overwhelming selection of techniques, tools and field recovery specialists to consult on the creation of goals and objectives. Tests of processes became evident as we observed the workers at task. Media and materials support were suggested by artifacts, the museum, and the video and slides we were developing. Methods of instruction were recommend by the potential students and instructors. And, even course evaluation strategies became clear as we noted what the person in the field must eventually know and be able to do.

Most importantly, however, the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TESTS
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TEXTS
WORKERS
MUSEUM
EVALUATION
EXPERTS

notion of the mosaic and the coming together of related but sometime disparate pieces gave focus to the I.D. activity; and, the ancient Maya themselves with the rich visual treasures they left us colored the design of the course.

The mosaic came together to reveal a very complex and compelling composite picture of ancient Mayan life, field experiences in anthropology, the role of dynamic instructional design and personal and professional growth. This is a mosaic that was particular to us in Copan in the Spring of 1987; but, one that might give an alternative image to some other course designer or student of I.D. who might be persuaded that course development is not the product of some strict linear model but a result of solving instructional problems given a context, some tools and a motive.

Situated Cognition and Interpretive Understanding

Shaun Harley

The purpose of this paper is to develop a discussion on a developing theory of "situated cognition" as it pertains to the relationship of cognition through visuals and the influence of the interpretive process through which we cognitively process information. The paper outlines the kinds of research that have been influential in the field and offers supplemental, if not alternative, explanations for research findings in the light of a "situated cognition" understanding. This is an exploratory paper and, as such, is being proposed as justification for further research towards the development of a theory of "situated cognition." At this point it is being proposed that the study of how we process visual information cannot be considered without direct reference to the influence that "situational definition" brings to our cognition; and that "situational definition" cannot be attributed to external agencies, but must be understood in terms of personalized "meaning making" on the part of the individual.

Technology and Cognition

With the development of an ever increasing armoury of electronically-based media, a predominant focus of research has been on the "effects" of particular media on an individual's ability to process the information presented. A common approach taken to the study of media and instruction has been to look at the effects of one medium in comparison to another (Clark 1983). A particular concern with respect to media and learning centres round the level of perception and depth of information processing that different manipulations of media will facilitate, if not actually "cause."

Much of the research into media and levels of cognitive processing concentrates on harnessing the formal features of the medium to best instructional advantage. The use of formal features, one study suggests, can draw attention to the material to be studied (Anderson & Lorch, 1983). Krull (1983) proposed that attention is co-moderated by both cognitive activities of the learner and by the formal features of instruction. Indeed Singer (1980) goes as far as to suggest that learners (especially children) are attentive as a function of the formal features of the television rather than as a result of active cognitive processing. Salomon & Leigh (1984) try to account for the interaction between medium and depth of cognitive processing in terms of attitudinal perceptions of the medium on the part of the learner. According to Salomon's (1981) model, children tend to invest less mental effort (depth of cognitive processing) when information is presented via television than when it is presented through books. The amount of invested mental effort (AIME), it is suggested, is related to the attitudinal perceptions of the individual towards the medium itself.

An underlying trend in this kind of media-centred research is the emphasis that is being placed on inherent characteristics of the media as they relate to the learner's cognitive processing. Research into "situated cognition" suggests that this approach has been overly "technocentric", a term used by Seymour Papert (1987) to describe the narrowly focused concentration on the effects of the technology with little or no reference to the contextual environment in which it is being expected to operate. A theory of "situated cognition" suggests that contextual cues within a particular "situation" (contextual environment) are contributory factors influencing not just what is cognitively processed but how it is processed in terms of the kinds of cognitive relationships being made by the learner.

A study of how an individual "situates" perception and learning demands a recognition of the context for human understanding in terms of a "situated" culture, and not just in terms of a discrete technology (Papert, 1987; Damarin, 1986). Herein culture can be understood not just in general terms as a common denominator among individuals, but also as the self-referential "meaning-making" an individual attributes to her/his environment. As "situated" cultures differ, so, too, might individuals within that culture differ in terms of the ways they learn and think within their contextual environment. If, therefore, a goal of researchers within a technology-saturated environment is to understand (or influence) the changes promoted through the use of technology-based media, then it is important that the investigation recognizes the culture as a whole rather than trying to understand the technology as an entity extracted from its personally determined cultural backdrop (Papert, 1987).

Situated Cognition

A theory of "situated cognition" is being proposed in the light of several qualitative studies that examined how the contextual exigencies of a situation in which individuals were operating were found to influence their thinking process. Lucy Suchman (1987) is a researcher at Xerox (Palo Alto Research Centre). Her study investigated how individuals use Xerox machines that have built-in help and diagnosis programs. Despite the preplanned strategies for trouble shooting the system, Suchman found that within the "situation" of the problem moment the learners worked with their own strategy and it was clear that the learned "expert" strategies were being constantly modified on a "moment by moment" basis. Suchman concludes that the "situation" became the final determinant for how to solve the problem and not the abstracted procedural knowledge assumed by external agents to be determinants of the most efficient course of action. Suchman indicates that the individuals were not algorithmically applying troubleshooting information as was assumed by the ontology of the diagnostic program, but were personally "redefining" what they were being told was problematic and subsequently applying their own generative strategies for personally determining what was going to be the best solution.

The work of Hass (n.d.) offers support to the hypothesis that the learner is indeed actively engaged in "situational meaning making" and is acting upon this definition to create plans of action. Her ethnographic studies in schools indicated that, although the teacher had engaged in teaching a problem solving strategy in the math class, the understanding of the assigned "problem" was being redefined by the students and the solution to the problem differed accordingly. For the teacher the problem was defined by the "mathematic text problem", to the students the problem was defined as getting the right answer to satisfy the teacher's requirements and have the teacher perceive that the students' resolution to the problem was inkeeping with that proposed by the teacher.

Similar conclusions were derived from a further study by Lave (1988) in which she examined the thinking process' of shoppers in a grocery store. She concluded that we make sense of a situation (how we think as participants within that situation) in terms of how we define our actions in relation to goals. Shoppers in this study demonstrated by their actions that "math knowledge" was not a decontextualized abstraction as it is often presented to students in the classroom. The shoppers' ability to use mathematics to solve problems was inextricably related to a "situational" understanding for how it was to be thought of. The individuals in this study were found to be proficient mathematicians in the context of a supermarket "situation" where they were generators of the problem definition, but were significantly less proficient when they were asked to apply the same kinds of reasoning towards a paper and pencil activity where the definition of the problem was delivered to them - not generated "situationally" by them. Clearly these people were not mathematically unknowledgeable, but it can be hypothesized that they were "situationally dependent" for how they understood and applied their mathematical ability.

Thinking with Situation

The grocery shopping "situation" influenced the way in which those people could think "with" mathematics. But most important, in terms of understanding how people think "with" information, is the acknowledgement that we are capable of and do think "with" information drawn from diverse sources considered by the individual as being situationally relevant. A consideration of "situated cognition" is about the recognition that we think "with" many bodies of knowledge *at the same time* as we define what is "situationally" relevant and determine what needs to be given the most attention with respect to our intentions within that situation. Lave's (1988) analysis of this phenomenon indicates that situations are integral to our process of cognition because they elicit from us schemas of information which are drawn upon to determine our actions. We think "with" the situation. Furthermore, the immediacy of "situatedness" creates feedback to the individual by which strategies of engagement are constantly being modified in direct relationship to the exigencies of "moment by moment" contingencies.

Further support for a developing theory of "situated cognition" comes from a study done by Sylvia Scribner (1984) at a dairy plant. "Preloaders" who, to facilitate their job, had learned that the most efficient way to count the contents of eight pack crates was by using the base eight were able to adapt their mathematical strategies to solve a simulated paper and pencil problem, while college trained employees were unable to change their algorithmic strategies to accommodate the "situation" they encountered in the same type of paper and pencil problem. It could be reasonably concluded that the preloaders had learned from "situations" that mathematics was not about the application of rigid, decontextualized algorithmic procedures, but that mathematics was a conceptual tool to be modified as and when necessary. In short the "preloaders" had already learned to think "with" situational information.

The Case of Dr. Howland

Last year Dr. Willard J. Howland, an emminent radiologist, was on vacation in Toronto, Canada. On his return home to Canton, Ohio a colleague stopped him in the street to say "hello." In their conversation the colleague commented that he was in Toronto and had seen a man that looked just like Dr. Howland walking along a Toronto downtown street. Dr. Howland proceeded to inform his colleague that he was indeed that man! Accepting that during the Toronto visit Dr. Howland had not undergone any major physical appearance changes, why therefore did his colleague have no difficulty in recognizing Dr. Howland in Canton and yet failed to recognize him as the same person when he was walking down a street in downtown Toronto? Pylyshyn (1973) points out that the processing of visual images involves a process of interpretation. The addition of supportive cues to aid in that interpretation has been found to be positively influential in enhancing that process (Anglin, 1986).

A theorizing of "situated cognition" leads us to considering that information processing has an interpretive component to it, and such a component is largely guided by a personal determination of "situational" elements of the context in which the information is to be found. A consideration of "situated cognition" allows us to explain Dr. Howland's colleague's inability to recognize him in Toronto by way of the colleague's "situational" interpretation of the visual information that he had in front of him. Toronto was not a place where Dr. Howland was to be found; Canton, Ohio was. The "situatedness" of Dr. Howland in Totonto or Canton were cues that influenced the colleague's information processing of the visual information that was being perceived.

While Paivio's (1971) "Dual Coding Theory" suggests that we process information using two systems, "situated cognition" might be considered as part of a more complex information processing dynamic. The situational aspect of "situated information processing" can be considered as a "propositional coding" in that our cognition involves a process of creating and testing hypothesis through which we come to make interpretive sense of the information stimuli that is being accessed. Of key importance is a recognition of the complexity of the "situational thinking" dynamic whereby an individual's "meaning making" activity is both heuristic and diverse as it incorporates into that thinking dynamic knowledge drawn from a multiplicity of sources.

As indicated earlier in this paper, Salomon's AIME studies try to explain depth of cognitive processing and learning in terms of attitudinal perceptions of the medium on the part of the learner (Salomon & Leigh, 1984; Salomon, 1984). In general, students were found to bring less "mental effort" into watching television than they did when reading books. These studies try to explain differences and similarities between groups in terms of media-subject interaction, while giving little consideration to place and time and the subjects' perceived purpose in being involved in the activity. In terms of an understanding of "situated cognition" the AIME might be explained more as a subject's reading of their own "situational" purpose and goals, than as an attributional disposition of the medium per se as a conveyer of information. Furthermore, while the researchers might be assuming that subjects were concerned enough in the content to be actively processing the information therein, the subjects processing activity might have been more influenced by their sense of why they were there; and indeed that was found to be so in one study with Israeli children who were instructed to learn as much as possible (Salomon & Leigh, 1984). A replication study by Johannes W. J. Beentjies (1989) reports that "for some books and (television) programs, however, the differences in mental effort are minimal or even nonexistent." This lends further support to a "situational" explanation that learning through media is not particularly influenced by an inherent perception of the medium itself, but by the nature of the "situation", defined by the learner in terms of the learning task and the nature of the material being presented.

The Case of Patrick Harkin

The anecdote of Dr. Howland's and his colleague serves to suggest that context and our sense of "situated" understanding within that context influences the manner in which we cognitively process (think) "with" the visual information. A more striking anecdote concerns my uncle, Mr. Patrick (Paddy) Harkin. Paddy is an elderly man who has all his wits about him and wouldn't allow you to con him for a penny! Paddy has retired after many years working in Britain to live in his hometown Annagry, a rural village in Donegal, Ireland. Despite the fact that running water was installed into the house only ten years ago, Paddy has a television and spends many a long winter's night watching whatever show happens to be on that evening. Armed with my new video camera, I went to see him.

I placed the camera on top of the television facing Paddy, and with the video output spliced into the television, I began to record. Understand that Paddy, at this point, was watching himself on the television screen. When asked to identify who it was that was being shown on the screen, Paddy did not recognize himself. To further cue him towards correctly identifying himself, I zoomed in on him so that his face covered the whole screen; he still did not recognize himself, indeed he did not even recognize the room he was sitting in which had also been shown on the screen.

To further cue him towards identification of the location of what was being shown on the screen, I panned out and clearly indicated objects around the room: his table, his sideboard, the mirror, his chair, his fireplace. At this point he recognized the location of the image being projected on the television screen but was still unable to identify himself as the individual sitting on the chair in front of the fireplace. As he verbalized his thoughts, he identified several propositions: "Is it your father"; "Is it Joe Doogan" (his neighbour); "Is it outside." I concluded from his verbal articulation of propositions and his kinesthetic activities that Paddy was very earnestly thinking. He was thinking "with" the question of identifying who was on the screen plus the visual information that the screen and his immediate environment were presenting to him. Finally, after three minutes forty-five seconds, Paddy recognized himself.

Why did Paddy not recognize himself despite a variety of visual cues given by zooming and panning on the scene? Paddy explained his final resolution for his self identification not in terms of recognizing his own face on the screen, but in terms of recognizing that the individual on the screen was wearing "the same trousers and jersey." It seems more likely that this was his penultimate proposition before his actual self identification. Clearly Paddy's failure to identify himself on the television screen is not attributable to insufficient visual data. And as Paddy has been watching and enjoying television for over thirty years, nor can it be explained as his failure to understand the formal features characteristic of the television medium.

Through a theory of "situated cognition" a more plausible explanation can be generated that explains this incident in terms of Paddy's interpretive processing of the visual information as it was being "situationally" presented and processed by him. He had had no previous experience of video technology. As a result, the idea of being able to instantaneously view himself on the television screen was not "situationally" credible. His previous experience with viewing television was understood as the viewing of historical events; that is, events that had happened, and been recorded, at some time in the past. Furthermore, the idea that he could view himself on his own television, in his own home, in real time was inconceivable. Paddy's information processing was directly influenced by how he "situationally" defined himself with respect to the television. He had defined himself as "external audience", not "internal participant." This "situational" definition was so established in his mind that he had great difficulty in processing the visual information he was receiving in any other way.

How then did he eventually come to reinterpret the visual information so that he was eventually able to recognize himself as the individual on the screen? The work of Suchman would suggest that the idea of being able to teach visual perception skills (Salomon, 1979) to enhance the cognitive processing activity of the individual can only be considered in the broadest terms. The individual, she contends, is really engaged in a process of defining and redefining interpretations on a "moment by moment" situational basis. A theory of "situated cognition" explains Paddy's interpretive processing of the visual information in terms of his "definitional sense making." As he looked at the screen, it didn't make sense to him that he could be viewing the present moment because television *doesn't do that.* Eventually, after the panning, he found it acceptable that this "scene" took place in his own house. Nevertheless, it wasn't him; perhaps because he didn't remember this ever happening. Eventually as he considered the information that the situation was presenting to him: same room, me being able to direct what was on the screen at will, his own "moment by moment" kinesthetic feedback; perhaps then he took a closer look at the individual and recognized that he was wearing the same clothes! Each of these elements, it can be concluded, allowed him to process the information as a series of propositions until eventually he came to the conclusion that the individual was indeed himself. In fact, his sense of wonder and amazement that such a thing could be possible right here in his own home is aptly summed up for him in his comment, "It's a miracle!"

Ethnography of Cognition

A theory of "situted cognition" supports the position that an individual's sense of context does not have objective definition, but is interrelated to who we are, how we understand ourselves, and consequently how we bring definition to our environment by virtue of who we consider ourselves to be within that situation. Lave (1988) considers this interpretive interaction between individual-knowledge-context as central to cognition; she refers to this as "an ethnography of cognition." In terms of implications for instructional practice, Streibel (1986) points out that we cannot assume meaning for the learner based upon our understanding of how we think that they are thinking. A theory of "situated cognition" behoves us to consider that within instruction, what stimulates the individual to think and the direction of that thinking process arenot subject to external controllable contingencies, but rather to internal stimuli which "situate" knowledge in relation to the individual's determination for what is considered meaningful.

Conclusion

A central concern with respect to the development of a theory of "situated cognition" is the recognition that cognition and learning is intentional and personally directed and occurs in a context of social and personal "meaning making." The nature of our perception within a particular "situated context" is inextricably subject to personal evaluation and synthesis with respect to our understanding of that information. In terms of implications for ongoing research into visual perception and cognition, the ideas presented by a developing theory of "situated cognition" indicate that experiences are integral to the knowledge development of the learner and not just a medium for information delivery. The onus, therefore, is for us to address the issue of an individual's sense of "situatedness" as we examine the questions of how to most efficatiously present information to a learner through the use of visual media or otherwise.

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Visualizing Cognitive Processes In Hypermedia Systems

Martin Retzer

Introduction

This presentation discusses ways to use visualization within hypertext and hypermedia applications to create a mediated learning environment.

Mediated Learning

One challenge to teachers has always been to provide motivating learning experiences for students. Our goal has always been to produce students who are intrinsically motivated to learn. Feuerestein and others (1980) have identified a "mediational teaching style" which they say promotes the development of intrinsic motivation in learners. Within this model, mediators:

1. Supply information that may be needed to learn relationships or to find solutions.
2. Ask questions, i.e., elicit rather than give answers.
3. Guide children's learning by arranging and directing sequences of experiences in a developmental fashion.
4. Bring about induction of explanatory rules by calling attention to similarities among isolated events.
5. Guide deduction of application of rules.
6. Build confidence of the children by communicating belief in their confidence as thinkers.
7. Maintain a meta-cognitive emphasis. (Feurestein, R. as quoted in Haywood and Swtizky, in press, p. 61)

All of these, in one way or another, are activities that can take place within a hypermedia system.

What does it mean to "visualize" cognitive processes?

Visualizing can take two forms. You are familiar with visual images such as photographs, videos, animation sequences, and other pictures or drawings. There is a rather large body of research on how to make effective use of each of these. Hypermedia allows the developer and consequently the learner the capability to use multiple media in combination. We will focus on how to manage an environment where the number and complexity of images can quickly overwhelm the learner.

One way to summarize visual information is through ICONS. Icons are simplified, often stylized representations of the more complex visual information which help the learner attend to the critical attributes of the object. Within a hypermedia system they can serve as mental "pegs" for the more complex image.

A central problem in iconic learning is the development of standard ICONs. The old adage "A picture is worth a thousand words" is certainly true of ICONs. A confusion results when they are not the same words and are interpreted differently by each learner. Iconic learning is relatively new and deserves more attention than we have time to give it today.

The second form of what I call "visualizing" means showing the relationships between abstract, verbal information. Most of what we learn is verbal information. If we learn it in isolation, it might properly be called "trivia". Learning become meaningful when we establish the connections and relationships between these isolated bits of data. Efficient learning strategies need to capitalize on visually representing the relationships between the tons of data presented to us.

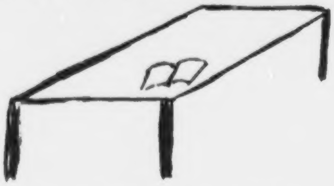
A branch of cognitive psychology called information processing theory attempts to explain how human beings store and retrieve knowledge.

Some theorists believe that all knowledge is stored in verbal form. Images are converted to verbal form for storage and then reconverted to images when they need to be recalled. He believes that if information was stored as images, the mind would quickly use up its storage capacity.

One basis for this belief may be the use of the computer as a model of human thinking. Almost all present day computers "remember" information (verbal or visual) digitally. Verbal information can be stored with little change, but digitized images require a much greater storage capacity. Very few computers currently in use store images more efficiently as analogs, but some can. As our understanding of how computers can be taught to process images, we may discover that the memory demands for human image processing are not as great as we once thought.

The dual-code model of knowledge representation (Paivio, 1969, 1970, 1971) states that concrete images (dog, cat, house) are stored visually and abstract concepts (truth, justice, the American way) are represented verbally. Objects that have both visual and verbal characteristics (house/home) can be stored both ways, although one predominates in retrieval (Gredler, 1986).

For example, compare the verbal information, "The book is on the table" and the picture below. As primitive as this picture is, it still conveys more information than the words. Obviously the image is more powerful. The verbal information leaves out many relevant details.



On the other hand, a sentence like,

> "The participant read the sentence and understood its meaning."

contains more information than any illustration alone can visualize.

```
participant <--> READ <--> sentence
   /\      \                  /\
   ||       \                 ||
   \/        \                \/
   ??        UNDERSTAND <==> meaning
```

The diagram above represents some of these relationships, but as you can see, there is one piece that can not be identified. We have an understanding that "participant" participates in something, but the context doesn't tell us what he or she is participating in.

Well-designed hypertext and hypermedia applications represent knowledge both verbally and visually. The need to represent non-linear relationships between the individual pieces of knowledge is the primary reason for selecting hypertext/hypermedia as the medium for development. The complex nature of these relationships can create problems for the developer and for the learner. Critical to this are ways to provide visual "signposts" as learning aids.

Models of Representation

Listed below are some of the ways knowledge can be represented. These can be used as the "visual signposts" discussed above or as a way to present information to the learner. In both cases, what we must stress is teaching learners to process information as it relates to other information rather than as isolated facts. If this information were on a hypertext system, you would be able to see a more detailed explanation of any aspect of this table. As it is, you'll just have to call (708-960-1500) or write to me. I welcome your comments.

```
To present      Use           Example

FACTS           Pie chart
                Bar graph     already known?
                Line graph

CONCEPTS        Spider map    feature-- NOUN --feature
                                        /  \
                                   feature  feature

                Concept
                hierarchy             CATEGORY
                                        /   \
                                  concept   concept
                                   /  \      /  \
                                 EX    EX   EX   EX

PRINCIPLE       Form          A 1040 tax form may be
                              used as a graphic for
                              instructions on how to
                              complete the form

CLASSI-         Matrix        You are using a matrix
FICATION                      to see this information

PROCESS         PERT chart
                                         WHILE - AFTER
                                       /
                              BEFORE
                                       \ WHILE - AFTER

                Cycle chart
                                   -> CLOUD ->
                                 /             \
                           evaporation   precipitation
                                  \            /
                                    <- LAKE <-

PROCEDURE       Flow chart
                                     STEP1
                                       |
                                    CHOICE
                                   /       \
                               OPTION1   OPTION2
                                    \     /
                                     STEP2

                Decision        IF    THEN    RESULT
                table           cue   action  feedback
                                cue   action  feedback

                Fishbone               cause
                map                   /   cause
                                RESULT --/
                                      \--\ cause
                                       \ cause
```

Research on Color: A Summary

Dennis W. Pett
Lucille Burbank

Introduction

Although color is being used almost exclusively in the production of instructional materials, the specific attributes of color are frequently not carefully considered.

There are three major factors to consider in relation to the use of color in instructional materials.

1. Color as seen psychologically and physiologically.
2. Color as photographed.
3. Color and learning.

There is frequent confusion when talking about color because the same names are often used to describe different colors, and different names are often used to describe the same color. To avoid confusion, it is necessary to define terms carefully. The following definitions of terms which will be used in this presentation are those most commonly used to describe the attributes, the characteristics of color.

1. *Hue* is the common name for the color, such as red, blue, or yellow.
2. *Value* or *brightness* is the lightness or darkness of a color measured by how much light it reflects.
3. *Chroma* or *saturation* is the degree of color measured by the amount of redness, blueness, etc.

Color as Seen -- Psychological

Although much has been written about the effects of color on people, there is relatively little knowledge, based on research findings, about how color affects people. However, some interesting studies have been reported.

1. Personal and social factors contribute to the psychological effects of color.
2. Children tested in beautiful rooms scored 26 points higher on an I.Q. test than children tested in ugly rooms.
3. Color can focus attention, but there is little evidence to show that color is superior to other cues, such as arrows, underlining, or other graphic techniques.
4. A high-value area on a low-value background, a low-value area on a high-value background, or a high-chroma area on a low-chroma back-

ground will attract attention more than difference in hue.

5. A compilation of many studies indicates the following order of color preference:

--blue
--red
--green
--violet
--orange
--yellow

There are, however, some individual differences.

6. There is a preference for high-chroma colors among young children. This preference decreases from grades 4 to 12 and the decrease is greater for girls than boys.

7. Girls tend to prefer high-value colors while boys tend to prefer low-value colors.

8. Extroverts tend to prefer reds while introverts tend to prefer blues.

9. Among adults there is good general agreement that blue and green are cool colors while red, orange, and yellow are warm colors. These are learned meanings.

10. Color meanings vary with culture and with persons from different parts of the world.

11. Color harmony, how colors seem to go together, depends on social/cultural background and varies from person to person and from time to time with the same person.

12. Harmony depends on the chief color, the range of colors, the relative size and shape of colored areas, and the overall design and context.

13. Colors appear to be harmonious when the combinations are familiar, when there are similar attributes of hue, value, or chroma, and when there is an apparent organization of the colors.

Color as Seen -- Physiological

Color is almost never seen as it really is.

1. Blue lines seem to recede and red lines seem to advance because they focus at different points in the eye.

2. Persons tend to see color as they expect to see it, independent of lighting.

3. Context is most important in determining how color is seen.

4. How a color is seen depends in part on the color seen immediately before it. This is called 'local adaptation.'

6. Acuity, differentiating details, tends to be best for colors in the middle of the spectrum, colors such as cyan, yellow, or green. However, colors at the end of the spectrum, such as red and violet, tend to create greater arousal when measured by galvanic skin response.

7. Seven percent of males and .5 percent of females are color deficient. For such persons value or brightness contrast between subject and background is the most important cue.

Color as Photographed

1. A color photograph always looks different than the color of the subject photographed.

2. Shadows appear darker in a photograph than they do when looking at the scene.

3. Colored objects under soft lighting look less saturated than under harsh directional lighting.

4. Variations in the color of the light

source are compensated for by the human eye, but not by film.

5. If the illumination on a subject in a photograph is not uniform, it will be seen as a property of the subject unless the lighting variation is indicated.

6. It is necessary to light a subject so that it looks different than intended, so the photograph will look correct.

Color and Learning

1. There is considerable evidence that, in general, color does not increase learning even when color would appear to be a cue.

2. However, color is preferred by learners, influences the affective meaning of pictures, and in some cases has been shown to produce a more positive attitude.

3. Color can have a positive effect by focusing attention on relevant cues.

4. A review of 42 studies indicated that color is more effective for search tasks than black and white. These would include such tasks as locating points on a map or differentiating, on a radar screen, planes at different altitudes.

5. Recognition memory for line drawings has been shown to be greater for colored versions as compared with black-and-white versions.

6. Color seems to have a variable value as an aid to learning. Colors that are easily named, such as yellow, red, or green, seem to be more effective than colors that are not as easily named, such as pinkish-violet or yellow-green.

7. A series of studies by Dwyer, Lamberski, and their associates have used instructional materials related to the human heart. In general, colored versions of line drawings, detailed line drawings, and heart models were consistently best in comprehension, terminology, identification, and drawing tests. Color coding was effective at the learning stage, but not at the testing stage.

8. Some nonobjective measures, such as observations of the researcher or comments by subjects, suggest that color has some influences not present in black-and-white materials. Journalism students watching black-and-white and color versions of a funeral and a football game on television made more detailed written responses and paid more attention to the audio track after watching the black-and-white version. Subjects viewing the colored versions made more emotional responses.

Using Color Effectively

1. Use high-chroma red or blue-violet to get an emotional legibility.

2. Use colors in the middle of the spectrum for optimum legibility.

3. Pay attention to the effects of local and lateral adaptations.

4. Pay attention to color preferences and meanings as they relate to your audience.

5. Choose the proper film and light carefully to produce the desired effect.

6. Use color to create interest, to attract attention, to add reality, to discriminate, and to differentiate features such as subject from background.

Note: This was primarily a visual presentation. A detailed bibliography can be obtained by request from:

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Visual Intelligence and Visual Tests of Intelligence Revisited

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What is Intelligence?

The meaning and significance of intelligence has been a matter of high interest and debate in educational and psychological circles for many years. Development of conceptions of intelligence began with roots in work on individual differences in reaction time in the 18th century and has progressed to the present through the work of Charles Darwin's cousin Francis Galton on empirical research in reaction time differences in the late 19th century, Galton's pupil James Cattell, also beginning in the late 19th century, who established experimental laboratories and began the mental testing movement in the United States: through Alfred Binet and Theodore Simon's pioneering work in mental measurement in the early 20th century with revisions in the 1920's and 30's by Lewis Terman and Maud Merrill James, and David Wechsler's instrument development reflecting views of intelligence as functional and adaptive, through Charles Spearman's factor analyses yielding the *g* (general intelligence) factor, and Raymond Cattell's conceptions intelligence as both "fluid" (open to change from learning) and "crystallized" (unchanging) in the 1940's.

Throughout this development of increasingly refined work in human intelligence, the tendency has been to develop measures of it (and conceptualization of it as well) from an atheoretic, empirical standpoint. In other words, intelligence tests have been developed to correlate with (or predict) success in life, most notably success in academic school work. Even in the case of Spearman's *g* factor, a general cognitive ability which is reflected to one degree or another by all tests of mental ability, Spearman avoided defining *g* as intelligence itself, only a factor common to measures of intellectual ability (Spearman, 1927).

The most widely used mental ability tests (e.g., the WISC-R and Stanford Binet) are among those that have been developed from a rather eclectic, trial and error fashion, looking for correlations with academic success rather than goodness of fit to a theoretic model of intelligence. For a variety of reasons, these eclectic tests as well as other less widely used but still important tests of intelligence have employed various visual tasks as either part of all of their make-up.

The visual aspects of intelligence tests are used in two primary ways. In some tests, visual mediation is used to get at cognitive processes which are not themselves inherently visual. These tests may be called "visual tests of intelligence." Other tests not only use visual mediation but are testing actual visual abilities. These tests may be called "tests of visual intelligence." Tests of both sorts will be of interest in this paper and will be discussed later.

Why are we Interested in Visual Intelligence?

The thesis of this paper is that the visual aspects of intelligence tests can inform visual literacy researchers and developers of cognitive and perceptual skills and processes which are of importance to learning and performance but which are neglected in school curricula. Our interest in visual intelligence translates into suggestions to "teach visual intelligence" does not necessarily follow from this thesis. We can, however, suggest that objectives which are behind instruction in learning strategies and cognitive strategies can be found in the visual task demands of intelligence tests.

Too often, it seems, school learnings in the visual domain are seen as soft, easy, peripheral, or insignificant. One contribution of looking closely at the task demands of these often fiendishly challenging and ingenious visual tests is to see the potential for depth and challenge in visual processing. The very fact that the difficult tasks come from measures of intelligence would suggest that they are not divorced from important human capabilities nor are they trivial exercises.

In analyzing intelligence assessment instruments for their relevance to visual literacy, we are following a similar path to that taken by a number of past papers by Ragan (1978a, 1978b, 1979, 1987) in which measures of individual difference in processing information called "cognitive styles" were analyzed for their visual literacy implications. A primary residue of those papers has been a taxonomy of visual literacy outcomes which is intended to point researchers and practitioners toward ambitious yet achievable learning goals from visual literacy activities. That taxonomy has been revised as a K-12 scope and sequence guide for visual literacy curricula (see Figure 1). A guiding principle in both the earlier papers and this one, as illustrated by the scope and sequence chart, is that major capabilities in the visual domain are products of cumulative learning. The abilities which visual and performance parts of intelligence tests may be "intelligence" measures to a large extent may be due to the lack of instruction which can lead to their learning. Another way to view this is to note that analogs to visual tasks found in intelligence tests are not found in standardized achievement tests. Achievement tests reflect what is expected to be learned from school curricula, and matters of visual/perceptual skill are apparently viewed only as matters of aptitude, style, and intelligence.

Some Key Test Instruments Involving Visual Factors

There are many intelligence tests which make use of visual factors of one sort or another. While not pretending to be a complete list, Figure 2 presents a summary of some of the most important intelligence and mental ability tests which employ visual tasks. The demands of

A K-12 Scope & Sequence for Visual Literacy Curricula

I. Primary Level: (work beginning at preschool and proceeding through through first grade, approx.)

A. Manipulation

- Motor and perceptual skills gained from holding, touching, and changing objects in the environment, both commonplace and unusual

B. Construction

- Knowledge of shape, form, color, figure/ground relationships, as well as motor skills from making primitive, non-perspective drawings, paintings, simple constructions such as cardboard cut-outs and cut and paste creations
- Beginning knowledge of photography, message creation, and visual language obtained from operating a simple camera to take pictures, viewing and sequencing pictures, and discussing them.

C. Abstractions

(not applicable at this level)

II. Skilled Level (work beginning at second grade and proceeding through sixth grade, approx.)

A. Manipulation:

- Tool using in complex, concrete visual-spatial problems, such as in mechanical constructions (Lego, Erector, etc.), sewing (with and without pattern use), and repairs (such as taking a clock apart and putting it back together)
- 2-D and 3-D image rotations using real objects as well as computer graphic software
- Sequencing and describing one's photographs to produce utterances of increasing complexity and subtlety

B. Construction:

- Drawing with perspective from objects present and absent with increasing complexity through this level of the curriculum
- Controlling variables in taking pictures to produce a desired result
- Controlling visual variables in photographic processing
- Making origami constructions and related complex constructions

C. Abstractions:

- Creation of visual plans/patterns in two dimensions
- Specifying photographic treatment for physical objects, actions and sequences
- Mental imagery capability extension, including visual memory enhancement and integration of partial images

III. Advanced Level: (work beginning at sixth grade, approx., and continuing through grade 12)

A. Manipulation:

- Ability to mentally manipulate complex and multiple visual fields and representations, as in work with topology and visualization of multivariate statistical models

B. Construction:

- Ability to draw imagined objects in three dimensions, idea sketching, production of original conceptualizations of high visual complexity and ingenuity
- Possession of one's own original photographic style

C. Abstractions:

- Multiple holistic appositional forms of abstract visual thought; lateral thinking; visual intuition; unique visual invention

Figure 1: Visual Literacy Scope and Sequence (adapted from Ragan, 1988)

these tests are wide-ranging and illustrative of non-trivial capabilities in the visual domain. We recommend that researchers and curriculum developers familiarize themselves with these instruments as a representative and high-quality sample of intelligence and cognitive ability tests which employ visual tasks.

Relationships Among Visual Intelligence Factors

Relationships among a wide variety of tests have been studied by Linn and Kyllonen (1980), Snow (1977), and Marshalek (1977). Building on Snow's 1977 study, Linn and Kyllonen studied 34 tests of knowledge cognition and perception, using 14 of the tests listed in Figure 2 (tests used in the Linn study are marked with an asterisk) using a variety of clustering techniques, including hierarchical cluster analysis followed by use of multidimensional scaling techniques; then a set of factor analyses including a principal components analysis followed by a common factor analysis and varimax rotation and a Maximum Likelihood Factor Analysis (MFLA). The hierarchical cluster analysis yielded five clusters which the researchers labeled: 1. General fluid visualization (Gfv), 2. General crystallized (Gc), 3. Perceptual speed (Ps), 4. Memory span (Ms), and 5. Familiar field (Ff).

A further analysis was performed using a multidimensional scaling technique which provided a graphic representation of the relationships among the clusters and the tests within clusters. The general ability clusters nearest the center of the diagram and thus containing measures with the highest average correlations with the other tests was the ***Gfv*** cluster (General fluid visualization), which included the following tests: Object Assembly, Identical Pictures, Block Design, Surface Development, Raven Progressive Matrices, Find a Shape Puzzle, Form Board, and Paper Folding.

A second cluster of particular interest was called Familiar field (***Ff***). The ***Ff*** cluster contained three tests: the Picture Completion Test, the Rod and Frame Test and the Bottle Test. The ***Ff*** cluster was hypothesized to measure the ability to select a relevant strategy from salient but irrelevant strategies in a familiar situation. Rather than using unfamiliar or geometric shapes, instruments in the ***Ff*** cluster employed familiar, meaningful images. These tests can all be said to be tests of visual intelligence.

All tests in both the *Gfv* and *Ff* clusters are visual tests Some of the tests are visual tests of intelligence (tests which use visual mediation to stimulate or demand verbal or logical processes such as inductive reasoning in such tests as the Raven Matrices) and others are tests of visual intelligence (tests of spatial ability or other visual abilities such as cognitive restructuring as measured by the Find a Shape Puzzle). (Linn & Kyllonen, 1980, p. 7) Linn and Kyllonen's factor identification and conceptualization contributes to our understanding of visual factors and the applications in an a variety of task and problem situations.

Visual Intelligence and Visual Factors in Intelligence

There is a bewildering variety of terms used to discuss visual factors in intelligence and visual intelligence factors.

Some Tests of Intelligence which Use Visual Tasks

- Film Memory*
- Gottschaldt Find a Shape Puzzle*
- Guilford-Zimmerman Spatial Visualization
- Identical Pictures Test*
- Pascual-Leone Bottles Test*
- Raven Progressive Matrices*
- Rod and Frame Test*
- Wiggly Block Test
- Zimowski Incomplete Open Cubes
- Tests from the WISC-R
  - Block Design Test*
  - Object Assembly Test*
  - Picture Arrangement
  - Picture Completion Test*
- Tests from the ETS Factor Referenced Cognitive Tests
  - Card Rotations Test
  - Choosing a Path
  - Copying Test
  - Cube Comparisons Test
- Tests from the ETS Factor Referenced Cognitive Tests, continued
  - Elaboration Test
  - Figure Classification
  - Form Board*
  - Gestalt Completion Test*
  - Hidden Figures Test*
  - Hidden Patterns Test
  - Identical Pictures
  - Map Memory
  - Map Planning
  - Maze Tracing
  - Ornamentation Test
  - Paper Folding*
  - Snowy Pictures
  - Storage Test
  - Storage Test
  - Surface Development*
  - Symbols Test
  - Toothpicks Test

* indicates that test is one of those included in the Linn and Kyllonen (1980) study referred to later in this paper

Figure 2: Some Tests of Intelligence or Cognitive Factors Which Use Visual Tasks

When we look across different tests we encompass differing theoretic and pragmatic orientations which makes placing these concepts into an organized set an impossible task. Yet it does seem useful to try to at least collect and where possible consolidate or organize these terms and ideas into some meaningful structure.

Zimowski (1987) has attempted a clarification of concepts by dividing the components of spatial tests into what he calls "analog" (involving spatial, holistic operations) and "non-analog" items (involving verbal reasoning). Visual tests may contain either or both analog and non-analog items. Analog items share a number of characteristics: 1. they involve judgements among rotated stimuli, 2. stimuli differ by orientations of other than 180 degrees, 3. distractors are mirror images or reference stimuli, 4. items require whole-whole rather than part-whole or part-part comparisons, 5. items involve rotation of an entire object as a rigid whole rather than only one or several pieces of the object, and 6. time is restricted (p. 2) Zimowski empirically investigated the relative degrees of analog and non-analog components of four tests, specifically the Zimowski Incomplete Open Cubes, Guilford-Zimmerman Spatial Visualization, Wiggly Block Test, and Paper Folding Test. Among these visual tests, factor analyses indicated that none of the tests were purely analog, each having different degrees and kinds on non-analog components. For example, items in the Paper Folding test, at first glance a seemingly pure visual task, can be solved by both visual imagery techniques as well as verbal rules and logic.

One of the more ambitious efforts to develop a coherent conceptual scheme to encompass cognitive factors was undertaken by Educational Testing Service (ETS) in the 1960's and 1970's. This effort produced a kit of 69 factor-referenced cognitive tests. (Ekstrom, French, & Harman, 1976, Harman, 1975). There are 23 factors to which the tests relate (see Figure 4), each factor having three tests developed for use in its measurement. The factors emerged as the product of a combination of theoretic/conceptual work and empirical analyses during the twenty year effort which led up to the 1976 kit.

The ETS work may be viewed as a more robust set of factors than the 120 factors in the Guilford Structure of the Intellect model (Guilford 1959, 1967) which has been criticized for lack of external validity of its factors. (Vernon, 1965) The ETS effort, by the way, also included identification of some 28 temperament factors in addition to the cognitive factors.

When the factors and tests in the ETS kit are viewed from the standpoint of visual tasks, we find that there is no simple dividing line between the visual and non-visual. Some tests present a visual task to assess an essentially verbal or logical capability. Other tests not only use visual tasks but are directed toward the assessment of a fundamentally visual capability. Figure 3 lists the factors and tests and identifies those tests which are of a visual nature with an asterisk.

An Example of a Visual Test of Intelligence: Raven Progressive Matrices

In the 1920's, John Raven developed a visual test which was intended to be a test of Spearman's *g*. Since that time, the Raven Progressive Matrices and associated tests (the Raven Colored Progressive Matrices and the Advanced Progressive Matrices) have seen wide use and amazingly little need for modification over many years of use. The Raven Matrices tests are particularly used as culture-free tests and for exceptional populations, with the Advanced Matrices being used widely with gifted populations.

The rules which are behind solutions to the matrices are not visual skills—they are rules of induction. The rules which must be found, selected, and used in taking the test are: 1. figure addition or subtraction (see frame E9 for an example), 2. distribution of three values (see frame A12), 3. Distribution of two values (see frame D11), and 4. Quantitative pairwise progression (see frame C4). Taking the test entails working through matrix problems which gradually progress from easy to difficult. The progression allows induction of the rules from simpler to more complex applications, so the tests are not only tests of ability to perform the more difficult tasks but also of ability to learn the rules which are the keys to solving the matrix problems which the test presents.

In studies of correlations among intelligence test scores discussed earlier (Marshalek, 1977, Linn and Kyllonen, 1980) in which visual, verbal and numeric tests are analyzed, the Raven Matrices tests are consistently in the middle of the correlation charts. The tests are apparently

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- Guilford-Zimmerman Spatial Visualization
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- Tests from the WISC-R
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  - Picture Arrangement
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  - Figure Classification
  - Form Board*
  - Gestalt Completion Test*
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  - Identical Pictures
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Factors and Tests in the ETS Factor-Referenced Cognitive Tests Kit

Flexibility of Closure	**CF**
Hidden Figures Test*	
Hidden Patterns Test*	
Copying Test*	
Speed of Closure	**CS**
Gestalt Completion*	
Concealed Words*	
Snowy Pictures*	
Verbal Closure	**CV**
Scrambled Words	
Hidden Words	
Incomplete Words	
Associational Fluency	**FA**
Controlled Associations	
Opposites Test	
Figures of Speech	
Expressional Fluency	**FE**
Making Sentences	
Arranging Words	
Rewriting	
Figural Fluency	**FI**
Ornamentation Test*	
Elaboration Test*	
Symbols Test	
Ideational Fluency	**FI**
Topics Test	
Theme Test	
Thing Categories Test	
Word Fluency	**FW**
Word Endings	
Word Beginnings	
Word Beg. & Endings	
Induction	**I**
Letter Sets Test	
Locations Test*	
Figure Classification*	
Integrative Processes	**IP**
Calendar Test	
Following Directions	
Associative Memory	**MA**
Picture-Number Test*	
Object-Number Test	
First & Last Names	
Memory Span	**MS**
Auditory Number Span	
Visual Number Span	
Auditory Letter Span	
Visual Memory	**MV**
Shape Memory*	
Building Memory*	
Map Memory*	
Number Facility	**N**
Addition Test	
Division Test	
Subtraction & Mult.	
Add. and Subtraction	
Perceptual Speed	**P**
Finding A's	
Number Comparison	
Identical Pictures*	
General Reasoning	**RG**
Arithmetic Aptitude	
Mathematics Aptitude	
Necessary Arith. Oper.	
Logical Reasoning	**RL**
Nonsense Syllogisms	
Diag. Relationships	
Inference Test	
Deciphering Languages	
Spatial Orientation	**S**
Card Rotations*	
Cube Rotations*	
Spatial Scanning	**SS**
Maze Tracing Speed*	
Choosing a Path*	
Map Planning*	
Verbal Comphnsion.	**V**
Vocabulary Test I	
Vocabulary Test II	
Extended Range Vocab.	
Adv. Vocab. Test I	
Adv. Vocab. Test II	
Visualization	**VZ**
Form Board Test*	
Paper Folding Test*	
Surface Development*	
Figural Flexibility	**XF**
Toothpicks Test*	
Planning Patterns*	
Storage Test*	
Flexibility of Use	**XU**
Combining Objects*	
Substitute Uses*	
Making Groups	
Different Uses	

*Asterisk indicates visual test

Figure 3: Factors and Tests in the ETS Factor-Referenced Cognitive Tests Classified by Visual and Non-Visual Characteristics

excellent measures of reasoning by induction.

Although the Raven is said to be a visual test of intelligence, it appears to not only test non-visual (or non-analog) factors such as reasoning by induction but also may test visual processes and skills, as evidenced by the solutions to matrices such as C8 and C12, in which the visualization of a transparent overlay is a significant assistance, and frame D9, in which rotation of direction of comparison is a part of the solution.

Studies by Just and associates (1985, 1989) have investigated the cognitive processes of people taking intelligence tests, attempting to build a theoretic account for what it takes to perform well on a visual test. The researchers employed time-honored techniques of cognitive science such as timing response, doing eye movement studies, and engaging subjects in think-aloud protocols such as "what were you thinking about when you answered that question?" Three factors have emerged for success on the Raven matrices: 1. linear induction of rules, 2. pairwise eye fixations, and 3. good management (deployment of attention and mental effort). Cognitive studies such as Just's may contribute to visual literacy by finding and pointing out these links between behavior, cognition, and visually-mediated operations which contribute to certain forms of intelligent problem solving.

Examples of Tests of Visual Intelligence

Although the Raven Matrices appears to be an excellent visual test of intelligence (as well as perhaps having visual intelligence components), other instruments appear to be tests of something we might call visual intelligence. Of the studies reviewed, those which appear to have the greatest respect and interest among researchers for their power as visual intelligence instruments are the Guilford-Zimmerman Spatial Visualization Test, the Rod and Frame Test, and the Pascual-Leone Bottles Test. These tests should be studied closely by visual literacy researchers for common elements and critical operations. They may assist those studying mental imagery, including the interesting recent work on 3-D image rotations by Belland, Zlavotka, Aust, and others.

The Training of Visual Intelligence

An Israeli psychologist, Reuven Feuerstein, may be the most prominent current proponent of raising intelligence. Feuerstein is known for his radical ideas on the trainability of intelligence. He has developed a kit of 14 training materials sets which are only to be used by individuals who have attended his seminars on his training methods. Although Feuerstein claims to have raised IQ in mentally retarded subjects, the gains are slight and his research designs have been severely criticized, leaving less that a completely savory impression of the researcher and his methods. (Dean, 1987, p. 162; Spitz, 1986, p. 173-182)

Perhaps the most ambitious effort at raising intelligence has been the "Venezuela Project." For the past twenty years, the entire nation of Venezuela has been participating in a grand experiment in an effort to increase the intelligence of the citizenry. (Spitz, 1986) A variety of techniques have been employed, including applications of Feuerstein's work. We were not able to locate evidence that the Venezuela project has had success in achieving its goals.

Aust and Harrington (1988) present arguments for visual intelligence training. They report work by Feuerstein and Kaufman and note that both approaches share the beliefs that "current theories about the static nature of intelligence may not be completely accurate...., that it may be possible to accurately identify and remediate cognitive deficits..., that intelligence is a multidimensional phenomenon (including) a variety of forms of visual intelligence" and that both approaches "use primarily verbal approaches in remediation, even when the deficit is visual in origin." (p. 314-315) Arguing for the potential of visually-based intelligence training, Aust and Harrington make an interesting case which deserves further exploration. We are concerned, however, about their recommendation for training in 3-D image rotation. Although the image rotation task may be something in which skills may be learned, these skills may not transfer to the Block Design Test as Aust and Harrington anticipate due to insufficient opportunity to experience a variety of examples and applications as a product of typically short instructional contact times involved in experimental studies of this sort.

One recommendation we might add for those intending to do studies which involve transfer is that the researcher consider assisting transfer by pointing out explicitly how skills learned can apply to other sorts of tasks in addition to those practiced. In the case of transfer from specific skills to a wide variety of applications such as may be found across a set of intelligence or aptitude tests, such enhancement of transfer may include assistance to the learner in conceptualizing the skills learned through naming, recognizing, and pointing out the utility of skills learned.

Recommendations on Training for Intelligence

Although we do not wish to discourage those who would attempt to train for intelligence, we feel more comfortable with an using our knowledge of significant visual capabilities as reflected in intelligence and cognitive ability tests in a content-embedded fashion. Particularly within such subjects areas as science, mathematics, music, art, and physical education, there exist what we will call **"visual cognitive strategies"** which may be explicitly taught within the school curriculum.

For example, students in algebra classes may make use of visualized representations of the parameters of equations beyond their usual illustrative use. Visualizations of equations can build visualization skills in addition to being more helpful in the learning of mathematics if enough explicit attention is given to the mental functions which are engaged in using these visualizations and to the generalizability of these visualizations in other settings.

Another example might be students in a gymnastics class improving both their performance on the floor as well as improving their imagery capabilities by instruction's inclusion of digitized renderings and manipulations of videotape feedback, in which the student can see sequences or sets of movement depicted as a solid figure. Again, as in the algebra example, provision of sufficient attention to the learning task from a visual standpoint involving the learner's cognition (and in this case, performance), may assist both the learning of the specific task at hand as well as contribute to important general abilities in the visual domain.

As a final example, we can consider students in a chemistry class. While viewing and manipulating the usual solid models of atoms, students may be assisted in their mental imagery of these models, for both the sake of improvement in the utility and relevance of the models for learning in chemistry's sake but also for the sake of contribution to a generalized imagery skill development.

The above examples may illustrate, along with the body of this paper, the relative neglect of important visual cognitive strategies in school work. It is as if, once students have learned to read in the primary grades, little or no serious attention is given to visual skills and strategies, particuarly as they relate to and contribute to academic learning. Our study of visual tests of intelligence and tests of visual intelligence has only deepened our belief that development in this area is one of enormous potential benefit to humankind.

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MTV And Sesame Street: Visual Images and Language

Daniel R. Maher

When I was teaching my Introduction to Sociology students the characteristics of language, I differentiated between a sign and a symbol for them with an example from Helen Keller's life. Almost everyone knows the story of when she was at the water pump and her teacher was pumping water all over her while "signing" the symbol for water to her—at that point she realized that the signing done on her hand was a symbol—she moved from interacting like an animal at the emotional and instinctual level to a symbol making human. A symbol is an object, utterance or motion with an arbitrarily assigned meaning. A sign, on the other hand, has a fixed meaning, much like the call and response of animals. An animal in the wild will scream or send a danger signal when a predator is near. However, that animal cannot lie and say there is danger when it is not present. In other words, signs cannot be manipulated the way symbols can. The main premise of my paper concerning MTV and Sesame Street is that the proliferation of material visual images has reduced our symbolic language to a system of signs. The material visual image has taken ambiguous words, ideas, or concepts and made them concrete.

This deconstruction of language, I argue, is a response or reaction to the abstraction of our existence. We live our lives out in abstract models. The workplace has been reduced to gross, meaningless movements. The assembly line, mass production and the emphasis on efficiency have disintegrated the individuals characteristics and given birth to techniques which "fit" everyone. Karl Marx identified this abstraction as alienation. By alienation Marx meant to be externally possesed, much like a slave. Alienation in the workplace, Marx suggested, leads to alienation from others and, thus, oneself. Once people and their actions became nothing more than abstractions that is how people related to each other and toward themselves—abstractly.

This level of abstraction has reached every aspect of our social life. We find ourselves in a schizophrenic state. I mean that descriptively rather than diagnostically. We are distancing ourselves from our symbolic ties to our world. History becomes abstracted to the point that no event is unique. Social phenomena are reapeatable. For example, the concept of social class can be laid on all populations of the past regardless of the individual context which was crucial to a specific time. We find ourselves "decontextualized". Our concepts become so abstracted that they can be applied to any situation. The entire genre of postmodern art is a tribute to this disintegration of historical orientation.

Sociologists, while they rush to the aid in making things concrete once again, go too far and make matters worse. The trend toward positivism and quantitative methods leads to the reification of every human endeavor, once again distancing us from real existence. Sociologists, for example,have developed scales of love in an effort to pin down its ambiguity. How much do you love your mother? One through five? This seemingly more concrete view of human behavior is another case of human existence as it is actually lived out being abstracted into generalities. Love becomes a thing which can be passed about. Love becomes a matter of technique. Numerous books are available which tell us how to be better lovers, better parents, etc. However, none of these techniques take into consideration the fact that love exists only in relation to hate and that they often exist simultaneously. Thus, I can only love someone in relation to how much I hate someone. I can hate some people that I love the most. Pain is another example. We all have different threshholds of pain and we know pain only in relation to how we experience pleasure.

This reification of human existence thus makes the abstraction of human existence appear less threatening and easier to live with. Likewise, the material visual image makes language and symbols which are ambiguous-more concrete, in other words, less threatening. When we encounter such ambiguous situations in life such as in metaphors we struggle for comprehension. Alas, the image comes to our rescue and dispels our misconceptions, telling us that, indeed, love is like a rose in the sense that a particular image can convey. Unfortunately, that image limits our perception of how we may see that love is like a rose. In music videos we encounter the same reduction. Music, for example, which inspires people to conjure up personal images, is given an image via the music video. Instead of the act of creating images being performed by people we merely absorb prefabricated images. Books have undergone a similar mutation. For example, who does Rhet Butler look like—Clark Gable! The image makes language more concrete.

When images are tied to consumption, as with advertisements, the idea of people reacting to images as signs, like animals, becomes quite serious. We consume images on television, in magazines, on billboards, in newspapers. We are immersed in a sea of images. When we go the store, to the mall, we recall those images and respond to them much as an animal would, we begin to salivate at the ring of a bell, so to speak.

We react to particualar products at a purely emotional, instinctual level. We have to buy a certain car because of the way it makes us feel; certain clothes are more appealing because they will make us "cool". This is no laughing matter. What is lost at the expense of these animalistic tendencies is the quality of our existence. " I am going to buy this sports car because it's really tough looking. I guess my children are going to be pretty cramped in that little back seat and I guess it isn't very economical but it's still really cool." This example may make this point seem trivial or trite but when the same criteria are used for finding a spouse, relating to one's children and interacting with people, the weight of the issue should be more firmly felt.

In the field of education, visual images have been embraced as if they were a life preserver by teachers and students alike, who can no longer deal with ambiguity or abstractions. The image makes concepts concrete. Sesame Street concretizes letters and numbers for children. Teaching children to recognize letters and numbers is one thing that Sesame Street has been praised for. Admittedly the recognition level is there, but what about the understanding and explanation of letters and numbers? Our children are responding much like animals when they see a number or letter and regurgitate it for us. Teachers at the college level find the same thing. If something is not written on the board the students will not write it down and, more significantly, will not remember it. They won't salivate unless we ring their visual bell.

The shift to the visual image has not left us intact! Many argue that the image is great because it gives us an immediate, concrete example of something.

I quite agree that it does. What I am suggesting is that it does its job too well. The image overcompensates for the abstractions we experience in life and promotes a lifestyle of call and response—we are spoon fed. We see a letter on the TV and we repeat and memorize it. We see a product advertised and we go buy it.

In order for any of this to occur an essential shift has had to have occurred—that is the shift when the word has come to be subordinate to the image. The mass media represents the epitome of the image dominating over the word. The result of the image, rather than the word containing the meaning is that language is reduced to a sign system. To illustrate how language as a symbol system has begun to degenerate into a sign system I will refer to music videos.

Within a decade of popular existence the music video has changed the face of music drastically. It is not necessary to single out MTV. Music videos appear on many other stations and, technically speaking, many commercials and television programs are nothing more than music videos. Since MTV is the best known example I will use it as my prime reference.

It is hardly debatable today that a picture is worth a thousand words. However, when that picture is given a word, the picture can only mean what the accompanying words do. Likewise, when music is put to video the lyrics can only mean what the video does. In other words, the meaning of the song becomes the meaning of the material visual images of the video. At this point music videos become distinctly different from music. As we listen, we conjure up mental images which are uniquely our own that are inspired by the music. Our own interpretation of the song is based on our own experiences. We give the song a twist which fits the context of our lives. It is this context which the music video erases.

E. Ann Kaplan in her book Rocking Around the Clock: Music Television, Postmodernism and Consumer Culture, points out that in the past, music had direct historical referents. Each generation tied its music to the time and space in which they found themselves. MTV "flattens" out time, so to speak. It takes forty years of rock'n'roll and "flattens them out into one continuous present, eliding the basic historical address of the songs" (Kaplan, 1988, p. 53). Kaplan notes that, "the teenage audience is one decentered mass that absorbs all the types of rock without noting or knowing their historical origins, for these have been all but erased," (Kaplan, 1988, p. 24).

Advocates of music videos will denounce this as "silly". Being able to see the entire range of rock'n'roll is great! It allows people to enjoy seeing all the old stuff as well as the new. Indeed, many people see absolutely nothing wrong with playing videos from different time frames and videos which are collages of past events. The actual process may not be "harmful" or bad but the consequences are devastating. Kaplan notes, "the erasing of the specific historical address inevitably involves a corollary dimunition of specific ideological or political comment"(p. 54).

Todd Gitlin offers a definition or description of postmodernism —

> In thepostmodernist sensibility, the search for unity has apparently been abandoned all together. Instead we have textuality, a cultivation of surfaces endlessly referring to, ricocheting from, reverberating onto other surfaces. The work calls attention to its arbitrariness, constructedness; it interprets itself. In stead of simple center there is pastiche, cultural recombination.
>
> Anything can be juxtaposed to anything else. Everything takes place in the present, "here" that is, nowhere in particular. (Gitlin, p. 102).

Gitlin's definition points out the disjunciton of music and its lyrics to any direct referent. The lyrics are at this point reduced to mere signifiers with which the video plays, and are not linked to any signifieds that would make a coherent statement. Thus in a strict Sausurian point of view, the lingusitc sign is scrambled up. Instead of a signifier and the signified having a direct referent they are left hanging, void of any contextual meaning. Although it may not be clear at this point, what we are seeing is the deconstruction of language being expressed in the postmodern art form of music videos. The symbolic nature of language is being compressed into the realm of the sign.

Anyone who has read a book and then seen the movie to the book has, without realizing it, been robbed of their mental images by the material visual image. If a person read Gone With The Wind, she would form her own image of what Rhet Butler and Scarlet O'Hara looked like. If they saw the movie their mental images of those characters would be replaced by the visual counterparts—Clark Gable and Vivian Leigh. This is precisely what music videos do to music and what the image does to the word.

When music is put to video, the interpretation and the mental images inspired by that song are intimately linked to the material visual images provided. One scenario that demonstates this is when someone sees a video to a song which was previously known to them only as a song, not a video. On contact with the video, the music takes on new meaning for the person. They may say, "Is that what that lyric means," or "I didn't have any idea that's what that song was about!" The point is, once a video has been seen the mental images previously inspired by the song are either altered to incorporate the new material visual images or are erased completely.

A second scenario would be of a person seeing a video without any prior exposure to the song. In this case all the images evoked by the song will correspond directly to the material visual image of the video. People are not even given a chance to form their own mental images. This occurrence has enormous side effects. The visual images of the videos "freeze" the words of the song and the motions of the artist. When a person receives images in such a manner, that video thereafter will "color" any experiences that are connected to that music even when the video is absent.

For example, the Van Halen video to "Jump" has David Lee Roth jumping all over the place in his own particualr "style". A person who has this video image in their head may imitate Roth's behavior during this song even when the music is not accompanied by the video. The "Jump" video is more or less just a band video which has no plot. Thus, the imitation of the visual images will most probably occur only when the music to "jump" elicits the response. A more potentially "harmful" video is the romantic video.

Romantic videos give very specific meaning to "love songs" "break-up songs" or, in general, personal songs. The dominance of the material visual image over the mental images in such cases becomes very significant. What is so "harmful" about a romantic video is that the material visual image of the song, not the mental image made by the listener, can color and influence how people behave. Instead of acting the way they normally would, they imitate what the actors in the video did or how the visual elements were played out.

An example of this is the video for "Always Something There to Remind Me" by Naked Eyes. This video came to me in the buff, so to speak, as I had no prior audio exposure to the song. The video portrays a man and a woman in a break-up situation where the woman goes off with another man. A characterisic of the video is the lead singer walking around with an umbrella. At the time this video received a lot of air play on MTV I was having a personal experience of swithching girlfriends. The specific details about the video and my personal situation are not important. What is significant however, is the way in which I remember those high school romances. When I look back on the situation, my memory is always colored by the images of the video. As I think of the two girls involved, I have my own mental images of them with images of the video interspersed among them, particularly, I see the lead singer with his umbrella. The dominant presence of the material visual image in my memeory makes me highly suspicious that the video influenced my behavior at the time.

A case in point which may be more accessible to everyone is the song and video of "Wind Beneath My Wings" by Bette Midler which was the theme song for the movie Beaches which also starred Midler. This song won a Grammy for best single of the year. The question must be raised if this can really be qualified as music anymore. Anyone who saw Beaches, which was a very emotional movie, has an emotional tie to the song "Wind Beneath My Wings." These emotions return each time they hear the song on the radio or see the video to the song. Quite obviously, the song is bound to the material visual image. The natural selection of popular music itself has come to embody the material visual image as a major factor. "In 1984, for instance, only three of the top one hundred billboard albums did not have a promotional video, " (Aufderheide, 1986, p. 73).

It is only fitting and perhaps ironic that the first video aired on MTV was "Video Killed the Radio Star" by the Bugles. Quite clearly, the video has become the dominant factor for the success of a song and even a band. The advent of MTV allowed bands whose music might not be aesthetically or mentally appealing to address the audience visually. If the video is funny or has "cool" stuff to look at, it really does not matter how bad or good the music is.

Thus, the "language of music" has moved from primarily auditory to primarily visual. The most popular music is that which has a video to promote it. The image which accompanies a lyric compresses the symbolic nature of the word into a single unit of meaning. The distance between the music and its meaning is shortened.

I am not suggesting the image has no redeeming quality. I see the image having many useful applications. The concern I am raising is applicable only when the word becomes subordinate to the image. For example, when the illustrations begin to be given a text rather than the text being illustrated. The domination of the image over the word in the areas of music videos and the mass media should be a red flag for educators not to try and compete with them for the students attention. If educators resort to the use of visual aids as the primary source for conveying information the symbolic nature of language in the classroom will be compressed into a system of signs. Students will only know what they can see, and will think primarily visually. The danger in this is the loss of distance between information and its receiver. It is in this distance that the symbolic nature of language exists. To close the gap necessarily means to move closer to a sign. To teach in this manner when the image becomes a sign, in place of the word which is a symbol, is to train our students as if they were animals.

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COMPUTERS
and
TECHNOLOGY

Computer-Based Multimedia: A New User's View of IBM's "Audio Visual Connection"

James Lockard

Although multimedia once referred to sound filmstrips and slide-tape presentations, today it is one of the hottest concepts in the computer world, a "Wow Technology" (Butler, 1990, p. 54). Hawn (1990, p. 35) implores us to "take a step back and get ready because the computer market is about to go on warp drive into the next market advance - multimedia." As in most areas of computing, multimedia is an evolving concept which necessitates a definition for purposes of this paper. Very simply, multimedia is a versatile means of communication that combines previously separate media into a single, unified, computer-based entity.

Based on Lehtinen (1990, July) and Hawn (1990), today's multimedia systems are computer-controlled production environments that enable creative integration and manipulation of video, audio, text, and graphic elements. Products (often termed 'solutions') created on such systems are also viewed or presented with the computer. While the original visual and audio resources may exist in any medium, analog or digital, the resulting multimedia product is strictly digital. Multimedia products may be interactive or simply presentational. Some include moving images as well as stills. IBM's *Audio Visual Connection* is one example from the burgeoning field of computer-based multimedia systems.

Computer-based multimedia began in the Macintosh world. It seems only logical that such a graphic application first would be implemented on an inherently graphical computer. However, as the potential of and interest in multimedia has grown, so too have system alternatives. Limited multimedia applications can be created with Apple II computers. The Amiga is a strong multimedia machine. Still, given the vast numeric superiority over competitors of IBM and compatible PCs, one might argue that the potential growth of multimedia is closely linked to its capabilities on the IBM platform. This paper discusses pros and cons of multimedia systems, then describes the *Audio Visual Connection* (*AVC*) system. Next the *AVC* is assessed within the established framework. Finally, speculation on the future of multimedia is offered.

The Potential of Multimedia Systems

Interest in multimedia has grown very rapidly, making the term suddenly commonplace. The scope is suggested by one study that projects the market for multimedia worldwide to grow from

$6.4 billion in 1990 to $24.1 billion in 1994, with over half of the latter in the U.S. market (Lehtinen, 1990, July). Barr (1990, p. 32) noted that although multimedia systems are in their infancy in both design and use, experts are "already predicting a vast impact on corporate communications." Meilach (1990, p. 28) spoke of "a new art form that will change the basic way we use computers to communicate ideas."

To Marc Canter, President of MacroMind Inc., a firm focused on Macintosh hardware and software, multimedia is demonstrating value in four areas (Meilach, 1990). The most significant areas are presentations and learning experiences. These are closely related and central to this discussion. Desktop video and scientific visualization complete the list, but are beyond the scope of this paper.

Presentations are obviously acts of communication. Successful presentations are often described as dramatic, dynamic, or attention-grabbing. Learning is a process that cannot be separated from presentations. Teachers "present," as do books, videos, and computer-based learning materials. Recall that the first of the nine events of instruction is to gain attention or motivate the learner (Gagné & Briggs, 1974). Striving to achieve that event in a learning situation leads directly to the same concerns that are so crucial to successful presentations. How does multimedia contribute to attaining this event?

Novelty Effect

First, do not overlook or discount the novelty effect. At this point in time, relatively few individuals have been so exposed to multimedia products as to become jaded. Whether the message being delivered is an attempt to sell cereal or to guide learning, getting and holding audience attention is critical. Something unfamiliar yet eye-catching and appealing can serve the purpose.

Multiple Modalities

Second, although novelty soon becomes familiarity, there is an inherent gain in multimedia that should yield greater lasting power. The gain comes from the ability of multimedia to appeal to multiple senses, to communicate in multiple modalities. Since most life experiences involve at least sight and sound, communication that involves only one of these is likely to be less appealing, which may in turn make it less effective. Has there been a call to return to silent films since the advent of talkies? Multimedia may involve not simply sight and sound, but also still or moving images with accompanying text and audio, all of which have been manipulated for maximum effect. This goes well beyond what someone armed with a camcorder is prepared to produce.

Recall again that the essence of multimedia is communication. Consider, then, what percentage of communication efforts truly appeal to multiple senses? Think of talking head videos. Think of typical class lectures, perhaps augmented in some cases by illegible scrawling on a chalkboard. Compare a typical classroom to the magic of Sesame Street. Multimedia can tap the same wells of strength that Children's Television Workshop so skillfully exploits.

Unified Medium

A third plus for multimedia is that it can be a unified medium and thereby simplify hardware requirements. Imagine a presentation that includes a series of overhead transparencies, a short slide tape segment, and perhaps a few minutes of video. The hardware setup could readily involve a large screen (or several), an overhead projector, a slide projector with audio tape sync unit and dissolve, a VCR wired to several strategically located monitors or a large screen projector, a few hundred feet of cables, assorted remote control units, and so on. The speaker carries a stack of transparencies, a slide tray, an audio cassette, and a video cassette. Now imagine a similar presentation created and delivered on a PC. Beyond the computer itself, the presentation requires a data projector and screen or appropriately located monitors. The speaker arrives with a pocketful of mini-floppy disks, or more likely, no medium at all, as the entire presentation has been loaded previously onto the computer's hard disk.

More Visual

Fourth, multimedia presentations may be more visual than is otherwise likely. Need anyone be reminded of the power of visual communication? Yet consider typical overhead transparencies. There must be a special level in Dante's Inferno for the person who created transparency plastic for photocopiers, and thereby sentenced countless individuals to a purgatory of sessions "illustrated" by projected images which were, perhaps, acceptable in print format. Line after line of tiny print, nothing more. Even transparencies that are well designed tend to depend mostly on text as a result of the production methods involved. Persons lacking artistic skill have been obliged to avoid images on their transparencies unless they had access to some sort of clip art or other "borrowable" resource. The limits of such imagery need not be described. What changes are afforded, even encouraged when photographic images can be incorporated readily into a presentation? When such images can be captured by the computer from any existing video source, including live camera input, or snapped on-site with a digital still camera?

Digital Manipulation

If the imagery potential just described excites your imagination, consider a fifth strength of multimedia systems. Because the images involved are digital, they are subject to manipulation previously the province only of laboratory geniuses. Digital editing opens a new realm of versatility for both images and sounds. Images can be resized, relocated, recolored, reshaped, retouched, overlayed with text without altering the underlying image at all, simplified, and so on. Sound can be altered in manners comparable to a synthesizer, and synced precisely to accompanying images.

Economies

A sixth strength of multimedia systems is that they can save steps (and possibly cost) in the production of presentations. Consider several unitary media. Producing a transparency in plastic may involve creating one or more paper originals, imaging the plastic, adding color, and framing. The process is unaffected whether the original is created by hand or computer, so long as the end result is a physical transparency. However, when the result is a digital data file, the entire job is completed at the computer and typically requires little more than creation of any original. Slide production requires a camera and film, time on location, film processing, sorting, editing, tray loading, and so on. (To synchronize with an audio tape and add multi-projector dissolve further increases the effort.) The same image type can be captured in ready-to-use format with a digital camera, or if a suitable image already exists in any video format, it can be digitized easily. The computer is the key hardware.

As a result of production economies, the final cost of a presentation may well be less than otherwise. More importantly, because everything is done at the computer, any image (or audio segment) is subject to modification at any time. Since there need be no reliance on other persons or equipment, the production time of the presentation is totally under the developer's control. Lead time can be minimal. In fact, multimedia systems may put production capabilities directly into the hands of more individuals than any previous medium.

Interactivity

Finally, multimedia presentations may afford a level of interactivity and/or flexibility well beyond that of the parent media. Butler (1990, p. 34) stresses that "the more options for control over a presentation, the better." Consider the potential for near instantaneous access to any component of a presentation, compared to any of the following: returning to a previously used transparency; showing on request a specific slide in your set (don't even think about trying to play its associated audio!); replaying a segment from a videotape. Consider the potential to put the presentation into the hands of the target audience on an individual or small group basis, without concern for their ability to cope with a Rube Goldberg hardware montage.

In short, multimedia is clearly a presenter's dream come true, a learning tool of unparalleled potential, the savior of audiences world-wide, the best thing since .... Or is it?

Concerns Regarding Multimedia

As with any new technology, it is easy to become blinded to realities by the adrenalin rush evoked by the possibilities. Will computer-based multimedia change *your* life tomorrow? Probably not, for a number of reasons.

Cost

Perhaps foremost among the detractions of multimedia at this time is the fundamental issue of cost. The kind of multimedia systems just described do not operate on base model computers, whether IBM-type or Macintosh. Multimedia is more resource intensive than virtually any other PC application. Multimedia work stations require:

- large amounts of RAM (i.e. measured in *mega*bytes, not *kilo* bytes);
- very fast CPUs (forget that old PC-XT or Mac Plus no one else wants, either); and
- monumental hard disk storage (you really thought a 40MB drive was BIG?)

The foregoing you'll need minimally, even to deliver your finished presentation, in most cases. For development, add to the above powerhouse computer some multimedia software (priced comparably to other major applications) and the circuit boards needed to digitize audio and video. The price just went up a few more thousands, although delivery stations may not require all of these items. Although rumor has it that multimedia capabilities will be included in the circuitry of future generation CPUs, eliminating the need for add-in boards and making every PC a multimedia development and delivery station, do not count on benefiting from such R&D plans yet this century.

Software

Second, to achieve the results so glowingly described as the promise of multimedia, the hardware / software combination that you use must make them available and accessible to you. Of the two, the application software is probably the greater concern. Whatever the capability of the multimedia hardware, your access to it is strictly through the associated software, unless you care to work on the hardcore programming level, say, in the C language. Thus, the software determines whether you can, in fact, perform the editing marvels described, whether you can retouch your digitized images, whether you can create a truly flexible presentation that does not lock you into a linear sequence as tightly as a videotape. Software has, since year one of the computer era, trailed hardware in its sophistication. Should it be different today with multimedia?

Unrealistic Expectations

Third, as with virtually all technologies, multimedia spawns a host of unrealistic expectations. Perhaps the relevant analog is desktop publishing. Despite the bold assertions of promoters, desktop publishing has not put typographers and printers out of business. Desktop publishing software coupled with a laser printer (an overlooked cost?) has put previously unimagined control over type size and style into the hands of anyone with sufficient time to learn to use it. It has opened the possibility of multicolumn layouts, flexible incorporation and positioning of graphics (such as supplied clip art), even inclusion of scanned images. What desktop publishing has not done is turn untrained individuals into experts in graphic communication -- the art and science of design and layout. The same sorts of things we amateurs have always done can now sport a veneer of professionalism. "If it looks typeset, it must be good." Or so it seems.

For all of the potential, multimedia systems have no inherent ability to promote superb communication. They may make it easier than ever before to use photo-grade images in presentations, to synchronize and blend sound and image, to edit for a specific effect. They do not, however, educate their users as to what is visually (or auditorily) literate. Is glitzy "bad" better than just plain bad?

Digital Degradation

Another concern focuses on the side effects of digitizing images. Digital sound, e.g. CDs, is not just equal to analog, it is clearly superior. The same cannot be said at this time of digital images. There is a quite noticeable degradation of image quality when an analog image (all video tape, camera, and disc images are analog) is converted to a digital image of much more limited resolution using a far more restricted color palette. These problems have solutions, but they require vastly greater computer memory than is common currently. A projected digital image is a pale replica of 16mm film or a 35mm slide.

Learning Curve

Finally, ease of use is very much a relative concept. One great attribute of chalkboards and flip charts as communications media is that no advance preparation is required. Neither is any great skill called for. Simplicity may be its own virtue. With multimedia systems, use comes down once more to software quality. Multimedia software is inherently complex if it also provides even a significant portion of the potential features. The learning curve is almost certain to rival other major applications such as desk top publishing. It may be possible to create a basic presentation with minimal system knowledge, but that's not why you wanted multimedia to start. Achieving the polish of the demonstration that first caught your eye is certain to require a substantial investment of your time.

Of course, learning is a front-end load. As you master the system, your growing knowledge will carry through all presentations. Expect the time required for any component of presentation development to drop radically after your first effort, but do not think multimedia production will ever become as fast and simple as the old flip chart. Further, like other skills, use it or you lose it. Multimedia is too complex to produce once annually, if you expect to internalize and retain the procedures.

The Audio Visual Connection

IBM's *Audio Visual Connection* is a specific multimedia system for the PS/2 line of personal computers. Poor (1990, p. 157) refers to *AVC* as "perhaps the most visible and exciting product in this fledgling multimedia category." Its components are the *AVC* software, an audio capture and playback board, and a video capture board. The software controls the boards, creates and presents *AVC* applications, and manages system resources. The audio board digitizes line or microphone input in real time and outputs the audio resources used by an *AVC* application. The video board accepts input from any NTSC source, as well as RGB and Y/C (S-video). It delivers nearly instantaneous image digitizing. Once a video resource has been digitized, the board serves no further purpose for that image.

AVC Work Station Configurations

Although IBM claims *AVC* will work with an 80286-based computer, test reports dispute this as practical due to extremely slow performance (Davis, 1990). For a full development station, experience suggests the following minimal hardware and software configuration:

- an 80386-based microchannel computer (e.g. PS/2 Model 80)
- a large, fast hard disk (e.g. 120MB or greater)
- 4-6 megabytes of RAM
- high resolution VGA monitor

- audio and video capture/playback boards
- OS/2 operating system (DOS 4.0 is possible, but too slow for most uses)
- AVC software

In addition, an optical (WORM) drive provides excellent archival storage of audio and video resources at reasonable cost. If you need several development stations, one could be dedicated to video resource production and the others would not require the video board.

A minimal delivery station (including audio playback) would be:

- an 80386-based computer (e.g. PS/2 Model 65SX)
- a 60-megabyte hard disk
- 640K Ram
- an additional 2 megabytes of expanded memory
- VGA monitor
- audio capture/playback board
- DOS 4.0

Delivery stations require the audio board only if applications to be delivered include audio resources. Presentations that are strictly visual require no special hardware.

Now let's turn to the unique AVC components individually.

The Audio Capture / Playback Adapter

The simpler of the hardware components is the audio board. It is a single digital signal processor board, available for either industry standard (AT) or MicroChannel bus. List price as of Fall 1990 was $565. The board has stereo line and mono microphone inputs, stereo line and headphone outputs. The output signal can feed a stereo system, or you can attach amplified speakers directly.

There are three audio digitizing modes. Voice quality with a minimal sampling rate produces files of about 5.5K bytes per second of audio. Music quality is roughly comparable to AM radio. It uses double the sampling rate of voice, and files average 11K per second. Stereo simply adds the second channel, and files grow to 22K per second. Thus, 90 seconds of music quality audio requires about 1 megabyte of disk storage. This is a substantial factor in hard disk and/or optical drive requirements.

The Video Capture Adapter

The Video Capture Adapter is available only for the MicroChannel bus at a list price of $2250 in Fall 1990. It digitizes images from any NTSC, RGB, or Y/C source in any of several modes. As with all digital images, there is a trade-off between resolution and number of colors. MCGA resolution is a very modest 320 x 200 pixels in 256 colors. The image often appears more natural than at full 640 x 480 VGA resolution, at which only 16 colors are available. (If the system has the more versatile IBM 8514 monitor and adapter, 256 colors are available at that resolution.) A unique VGA8 mode works well for most purposes, and without extra hardware. It provides 360 x 480 pixel resolution with 256 colors, an acceptable compromise.

Because of the wide variety of input and output devices and types supported by the video adapter, the connector for external devices appears to be very complex. In fact, there are ten different RCA jacks, each on its own thin cable within a cable bundle, each clearly and permanently number coded. Just keep the manual close by to look up the use of each.

The AVC Software

The *AVC* software is truly multi-function. It provides control over both video and audio boards, supporting capture (digitizing) and editing of both resource types. A third module permits creation of "stories," the final multimedia solutions. There is also a graphics and text editing module and a file manager (Poor, 1990). A separate memory-resident utility permits capturing any screen you can display with any other software. Images may also be imported directly in IMDS, Targa, and TIFF formats. A runtime module permits distribution and use of presentations on machines lacking the complete *AVC* software.

Each *AVC* application is stored in its own subdirectory on the hard disk. The directory is created automatically when you specify a new application. An application contains reference to common libraries of files, audio and image resource files, and stories which combine the resources into completed multimedia products.

The *AVC* user interface is reminiscent of IBM's *Storyboard* software, essentially a fill-in-the-table approach. Rows represent a single element in the story -- an action to perform on a specified resource (e.g. play "mozart") or a programming statement to achieve a desired outcome. Columns define the elements to specify, such as transition effect and speed of its execution, whether an entire resource (image or audio file) is to be used or only part of it, and so on. (Unfortunately, since *AVC* operates best under OS/2, which does not support screen dumps or captures, it is not possible to include an illustration of this within this paper.)

Menu choices appear on a line across the top of the screen. Selecting any one produces a drop-down menu of its subfunctions. Many table cells can be filled in semi-automatically by selecting 'prompts.' In creating stories, resources can be selected directly from the directory, with choices inserted into the table complete with correct syntax.

The drawing capabilities are similar to paint programs, though less versatile. Images can be created and combined to produce respectable animation sequences.

Presentations need not be linear, as is typical of those created with *Harvard Graphics* or *StoryBoard*. Rather users can respond to requests for input, and the presentation can branch interactively based on the response.

As with most authoring software, the price of comparative ease of use is a limited, essential repertoire of capabilities. For those who need more and are willing to get into programming, the Audio Visual Authoring (AVA) language far surpasses the *AVC* basics. Beyond direct manipulation of *AVC* objects, AVA provides commands for data manipulation, file management, and communications with larger computer systems (Davis, 1990). Links to external databases and some hypertext-like functions are supported, as is integration with external applications via either the C language or IBM's *KnowledgeTool* expert system.

Strengths of AVC

The following observations are based on a limited time period spent working with the first release of the software. As such, they are tentative at best and subject to change based on further experience and software upgrades in the future.

Installation of the hardware in a MicroChannel machine proved straightforward, comparable to any other board installation in a PS/2. The software is self-installing under OS/2. To run under DOS 4.0, a memory manager such as 386MAX is required.

A major strength of *AVC* is the tight integration of its various components. Moving from audio to video modules is very easy, as everything works essentially the same. The *AVC* system is generally quite easy to work with once you learn the conventions. The F3 key is the exit key under most circumstances. Hot keys speed the task over choosing from the menus; most are reasonably mnemonic, such as Alt-Z for digitiZe, Alt-E for Edit, and so on. The user need only ask to edit any resource (image, audio, story) in the application's list, and *AVC* intelligently supplies the correct editor.

Capturing an audio resource is very simple, and the result can be edited in 0.1 second increments, allowing functional control over the result. However, there is no provision to modify the sound itself, as MacRecorder allows -- no pitch changes, no backward play, etc. Independent channel control and source mixing are supported. Any specific point in the audio (i.e. any 0.1 second segment) can have a label attached which permits exact synchronization to images. Volume is controllable from 0 to 100%, and transition effects include fade in and out.

Video capture is somewhat more complex, in part because three monitors are involved. The first displays the actual image from its source. An additional RGB monitor displays the image as captured, but also affords control over color, contrast, and brightness *before* the image is recorded to disk. The computer monitor is a control panel during the process and does not display the image during capture. The final image may be the entire original display or only a part of it.

Adjustments to the image become much easier with experience, as the user develops a sense for how the image will look after digitizing. Video images can be altered only prior to their final storage onto the hard disk. This precludes finetuning of images when they are combined into a finished application. Recapturing an image if the original was not satisfactory is straight forward.

When digitizing from a moving source, it may take several tries to get the exact frame desired, although the capture is virtually instantaneous. The ideal video source is laser disc so that a frame can be frozen for digitizing. Existing still images can be captured by mounting a video camera on a copy stand. Digital SLR cameras also work very well as image sources.

Digitized images are modest in size, averaging about 100K per image in VGA8 mode. Thus, the storage demands of digital images are less severe than audio's requirements. However, since one image requires 100K and motion requires 24-30 frames per second, the requirements of full motion digital imagery become painfully clear.

When creating a story, existing image resources can be used in their entirety or in portions. For small images, disk space can be conserved by combining multiple small images onto a single screen, then displaying selected parts as needed. Because the images are digital, they can be resized and shaped, although the result is not always pleasing. Parts of an image can be inserted into shapes created with the paint-type drawing tools. Image location on screen is determined in the story, making the composition of the original image less critical. In short, image manipulation is extremely flexible.

Another significant feature is the ability to add text in an array of fonts, sizes, colors, and outline / shadow effects to any image. The text and the image exist in separate plans, allowing complete text manipulation and experimentation without harm to the image itself. Anti-aliasing produces text images that appear remarkably free of jaggedness (Poor, 1990).

Weaknesses of AVC

AVC offers users a full feature multimedia environment with one major exception: motion video. Although it is quite possible to digitize a frame from a moving image, such as a videotape that is playing or live camera video, the final application cannot show moving images. Movement can, however, be simulated with respectable animation capabilities. Further, an upgrade to the original *AVC* software released in late 1990 provides support for the IBM M-Motion video adapter for those requiring full motion.

Audio seems less versatile than on a Macintosh, even with only the inexpensive MacRecorder. The MacRecorder user interface is also much nicer, as it displays sound wave patterns rather than just box patterns, and seems to afford more precise editing control than *AVC*'s 0.1 second intervals.

Aside from editing potential, the size of the audio files is a concern. At even music quality, any passage over about two minutes in length would produce a file too large to copy to even a high density diskette. This suggests that moving a finished application from a development station to a delivery station can get tricky. *AVC* would be a stronger product with better digital compression algorithms, especially for audio. Compression is, in fact, one of the major issues in other digital technologies, such as CD-I and DV-I (Heller, 1990).

A final concern is the speed of the first release of the *AVC* software. Even on 16 megahertz or faster 80386 computers, performance is less than crisp in some cases. The online help system suffers especially in this regard. One begins to feel that it could be faster to locate the information in a manual, except that the *AVC* manual is very thin and general. Performance improves very noticably on an 80486 computer, but who has access to one?

Speed is also a factor in delivery where audio and visuals are synchronized. Sync is very much tied to the CPU and hard disk speed, so any change from development to delivery system can destroy carefully developed linkages.

Overall Assessment

There are always advantages and disadvantages to being a leader in the marketplace. The *Audio Visual Connection* appears to be the first such product to become widely available for the PC. As a first effort, it is remarkably good. For a beginner, there is little more to ask for and some of the short-comings appear to be addressed by the M-Motion Video Adapter/A and upgrades to the *AVC* software. Given the infantile state of PC-based multimedia development, there is no reason to shy away from *AVC* if you can afford it. *AVC* itself is inexpensive, even with the digitizing boards, but if you must purchase a PC powerful enough to support it, the total package becomes costly.

The Future of Multimedia

Is computer-based multimedia more than a flash in the pan? Is it one of the next great applications of the PC? Here are some views from a murky crystal ball.

Excitement

Few presenters, whether classroom teachers, corporate trainers, or casual speakers, would fail to find the promise of multimedia exciting. Just seeing a good demonstration is enough to start the "Wait til I get my hands on that" syndrome in creative types. The excitement multimedia can generate is probably the critical element of its potential.

In 1990, desktop multimedia is still rather exotic, even unknown to most of its potential users. Locally produced multimedia seems likely to gain ground and truly become another basic PC application only when costs fall, computer power demands decline or the "typical" PC system is sufficiently powerful, and the production process is further simplified. To get from the "I want that" stage to the "I'm willing (and able) to create that" stage will require refinements.

Justification

Lehtinen (1990, September) sees cost justification as the critical element in acceptance of multimedia. He sees four ways in which this is possible. First, multimedia is (or can be) an extension of computer-based training (CBT), a way to enhance its realism. The cost-effectiveness of CBT is already well accepted in many quarters, perhaps offering an entry point for multimedia.

Second, all organizations suffer from the crush of massive amounts of paper, much of it simply historical documentation of some sort. Multimedia systems might offer significant cost benefits simply as repositories when all the costs of paper including its weight and bulk for storage are included. Related to this is a move already under way to reduce paper documentation for computer software and hardware with online versions. The effectiveness and appeal of such electronic manuals could be greatly enhanced if they were multimedia applications. The printed documentation for *AVC* is relatively thin, except for a detailed manual of its programming language. The far more complete online reference is itself an *AVC* application! This is a good example of "use the medium to teach the medium."

Lehtinen's third application of multimedia that is cost effective is for presentations where more than lecture accompanied by paper or even audiotapes is required, but for which original video is more than needed. Multimedia can fill that large niche at acceptable cost.

The fourth justification for multimedia is cost itself. Consider that all media hardware is costly, yet most of it has little use beyond its most obvious purpose. What do you do with video cameras and editing systems if they are not being used in a production? A multimedia system is still a fully usable PC which can continue to function for word and data processing when not being used for multimedia.

Copyright

Aside from basic technological and cost issues, there are ethical and legal issues concerning copyright (D'Ignazio, 1990, February). The ease with which the copyrighted work of others can be digitized and used within a multimedia application certainly encourages such use, just as photocopiers have permitted and encouraged duplication on a scale previously unthinkable. D'Ignazio suggests that the copyright law is murky concerning desktop multimedia and that educators in particular cannot wait for clarification before proceeding. The opportunity cost would be too great. Rather, he recommends applying standard fair use guidelines to multimedia, such as: credit the original source in a bibliography and reference note, keep borrowing to a very small percentage of a total work, and do not charge for the finished product.

Commercial Applications

It is quite possible that the real future of PC-based multimedia is not local creation of material at all, but rather use of commercial products. Such a pattern would follow from the case of computer software: some is custom produced locally, far more is purchased in the marketplace. Laser video discs have long offered a multimedia environment, but one lacking some of the flexibility previously described because the laser disc is an analog medium. Perhaps the future lies with CD-I (Compact Disc - Interactive) or DV-I (Digital Video Interactive), both of which are nearing the market (Heller, 1990). Each has the potential to deliver interactive multimedia products on a compact disc small enough to permit installation of the necessary drive in many existing computer cases. The massive storage potential of a CD (some 650MB) is ideal for multimedia; the low cost of replication makes economical distribution feasible. Both technologies bear watching closely in the near future.

Conclusion

The power of multimedia is clear to those who have experienced it and especially exciting to those committed to visual communication, to visual literacy. The potential of a multimedia system as a visual learning experience is truly enormous. Those who can muster the resources currently required to work with computer-based multimedia should find it an exciting and rewarding experience. Those who must now sit on the sidelines should make every effort to keep abreast of developments which are being widely covered in the press. They should also promote the idea and continually press superiors for the financial support needed to move onto the playing field. The D'Ignazio series in the reference list includes articles on hardware configurations that are much more affordable than the *AVC*, while still being very suitable for many contexts. Don't count yourself out until you have truly explored the possibilities. The future is visually yours -- with multimedia.

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A Visual Experience with HyperMedia As the Learning Tool

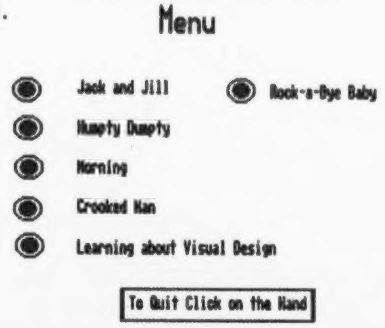
Ann S. Dana

"Dead! How can instructional design be dead?" (Merrill, 1988) The explosion of new software promises great achievement. This innovative software is enabling classrooms to integrate merging technologies with new teaching strategies (D'Ignazio, 1990). Teachers and students can design new ways to teach and to learn. Hypertext or hypermedia or multimedia gives the ability to link any place in text stored in a computer with any other place in the same or different texts or to other media across non-linear pathways (Horn, 1989).

Hypermedia is the term to watch in educational technology for the 1990's. Students are motivated when actively involved with their own learning. Hypermedia allows this to happen. The term "hyper" comes from a Greek term meaning "that which is or exists in a space of more than three dimensions" and "media" is a term that refers to "a means of communication". In the information age, communication is a key to making connections. Computer-based hypermedia (or multimedia) not only accesses information unlike traditional research but produces a product which is unlike the research paper of the past (Orkansinski, 1990). Hypermedia lets students use the computer interactively to make connections between many curricular areas. Give students the opportunity to access the exciting possibilities of the Information Age. They will find more ways to delve into a subject than they ever did with pencil and paper (Smith, 1990).

The tools needed are a computer system, an Apple IIe, IIc, IIgs, a MacIntosh, or an IBM; a mouse and software. Other media tools, such as CD-Rom and Video-Disc, can be very important components but are not necessary for the students' first experience. The software used depends on the computer system. Tutor-Tech and HyperScreen work with the Apple IIe family. They are the least sophisticated, but because of the number of IIe's in elementary and middle schools they are important. HyperStudio works with the Apple IIgs. HyperCard comes with the MacIntosh. LinkWay is IBM software. In order to author easily, a mouse can be effective; Tutor-Tech requires one.

HyperCard suggests a stack of index cards. That is precisely how the system works. Each screen that is designed becomes a card in a pile, or a stack. The cards can be arranged in any non-linear order. Each card contains from one to several buttons. the buttons have a script that tells what action to take when clicked; such as go to another card, display a pop-up field, create a sound, or engage a video sequence. Buttons can be a variety of shapes or designs. They can connect a picture to a description, a word to a glossary, an icon to a map, or to whatever your imagination foresees. As an example, clicking on part of a map can lead to information about a place or an event. Usually there is a button shaped like a house that when clicked takes you back to the beginning or to "home". A menu card would be an important adjunct to give the user the option to make a different choice (Merrill, 1988).

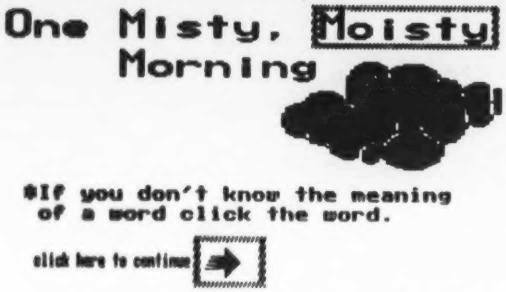


Introducing students to hypermedia can easily be done by creating a demonstration disk or by using the sample stacks available. Emphasis on the critical elements of screen design makes it important to model, demonstrate, display visuals, and interact with the students as they do their planning.

Planning involves choosing the topic, mapping a projection of possible screens, and choosing visuals that would be appropriate. It is necessary to consider how, where, and by whom the project will be used (Burbank, 1989). It is important for teachers and students to become active participants in the creation of meaningful materials. By critically analyzing and questioning the intent and purpose of the usual prepackaged materials schools use, teachers can expand on their meaning (Muffoletto, 1988). Hypermedia becomes a medium for this expansion.

Lesson: Planning
Choose the topic
Know who the audience will be
Gather resources
Choose the introductory graphic
Plan layout by sketching graphic & text placement

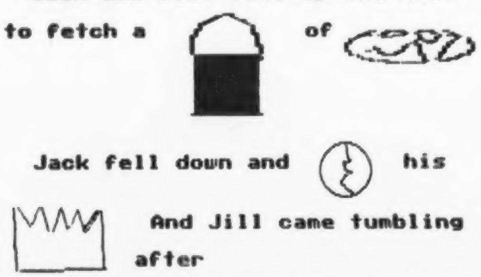
The design elements of shape, balance and form are important in graphic selection. In helping students plan their stack, pointing out the importance of the graphic choice and its screen placement, reinforces the importance of illustrations to the school age child's learning (Pettersson, 1990). When text and graphics are combined on the same screen the use of wordwrap and the white space around the graphics are factors in comprehension (Knupfer, 1990). Designing these pages (or cards) is the next step and they can be created before any connections are made.



One Misty, Moisty Morning

*If you don't know the meaning of a word click the word.

The selection of the font, the size and style of text characters should be carefully considered. Dark letters on a light screen appear less confined and more natural to the student (Merrill, 1988). Text should be presented in upper and lower case, using short lines or phrases of one idea per page. Plenty of white space is essential.



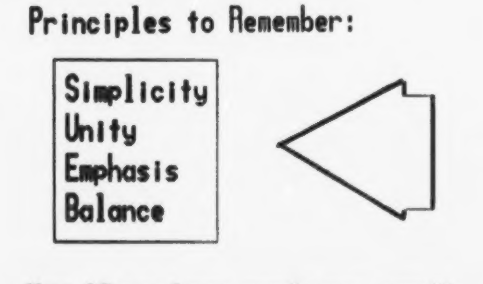
Jack and Jill went up the hill

to fetch a of

Jack fell down and his

And Jill came tumbling after

Color adds interest. It is used to create excitement and enhance motivation. Keep to no more than four colors per screen.



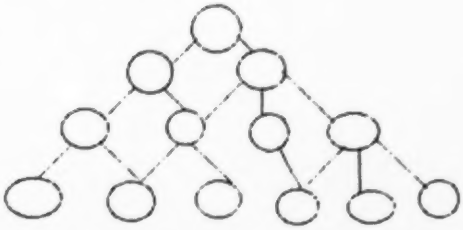
Principles to Remember:

Simplicity
Unity
Emphasis
Balance

Use 10 or less words per card!

Pages should have an icon and / or a button that marks where the user would click to go to a different page or to cause an action to take place. Dragging a button tool causes a framed box to appear around an icon. These do not show when the stack is being used. When a button is placed, the script window appears and expects connecting page or action to be named.

A myriad number of connections



Lesson: Planning connections
Plan what screens should connect
Choose appropriate clip art for buttons
Place buttons in a set pattern
Cut and paste to duplicate
Choose the script to control connections

By using the preview option, editing can be continuous and more easily accomplished.

Beginning with student projects where closure can be reached in a few sessions helps to give them the independence to try different approaches. The Speech option was one of those made possible using the Echo Speech Synthesizer with Tutor-Tech. HyperScreen has the speech option included. Using any option is easier with two disk drives.

Lesson: Speech option
Students decide on phrase or sound to add
Button link and directions are added
Speech or sound added
Preview and Edit if needed

As a final analysis, students share programs. The first project of rhymes were compiled on a disk to circulate to the elementary buildings. Groups projects followed where everyone works on a stack. Stacks can be connected as easily as cards. The possibilities are endless. The students are receiving an invaluable experience in how to be in charge of their learning process. They are discovering how their perception of a topic may be different from someone else's but that all are important links. Connecting these links will give them a broader outlook on a topic. By cooperating and accepting, their world will be richer from the experience of interacting with hypermedia.

Hypermedia is not just a term - it is an invaluable experience. It is here today and will certainly be expanded in the future. It is fortunate that Tutor-Tech and HyperScreen let our students get into the act easily and richly.

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Investigating Still Video Photography

Philip Konomos
David Ragsdale

Definition

Before we can easily discuss the history of still video, we need to first discuss just what we mean by "still video." Still video (SV), is sometimes used as umbrella nomenclature for any non-motion electronic imaging, but it should not be. Still video is not the same as electronic photography, a point that is important beyond mere semantics. Still video is a specific subset of electronic photography.

In order to maintain clear comprehension, the term, "still video," is usually confined to systems that store images on the 2-inch still video magnetic disk. This disk has become a virtual standard, being the chosen format of the Still Video Conference, a standard agreed upon by some 40 major and minor players in the photographic industry.

Even with this generally accepted clarification, variations do exist. Sony uses another name: still image (SI). Without definition of terms, we could discuss still video in one paragraph, still imaging in the next, and not know whether we're talking about one recording technology or two. Further variations of the theme abound. Polaroid has introduced what it calls Still/Video (S/V), recording monochrome still images along a 6-frame length of tape on an S-VHS videocassette. Fuji and Toshiba have demonstrated snapshot cameras that use no magnetic media for the recording, but store the image as data in an integrated circuit. Both units record and reproduce electronic images, but we should certainly hasten to wonder if they are the same as still video.

Any videotape can be paused, yielding a video "still". Using a 35mm camera, you can photograph a monitor screen, capturing a still of video. Polaroid and others manufacture image-capture devices that grab stills from video. Furthermore, the computer-graphics industry offers optical systems that permit publishing stills that originated in video. These methods are enormously diverse. Even though they all produce video stills, none are what people think of when they say still video (Sutherland, 1989).

History

After the development of the still video disk in the 70's (see Storage Systems), Sony developed the first still video camera, the Mavica, in 1981. However the Mavica was not commercially viable (Sutherland, 1989). The big push for SV photography came in 1986. In July of that year, Canon U.S.A. Inc. introduced the RC-701, the world's first commercially available electronic imaging color camera. The still video camera was designed to be used with its dedicated transceiver for over-the-telephone image transmission, still video recorder for instant playback on TV sets, and hard copy color printer ("Still Video," 1986).

As was to be expected, the electronic still video camera system stole most of the show at the Photokina show at Cologne, West Germany, held in September of 1986. Canon displayed their whole SV system; the RC-701 camera, the RR-551 recorder/player, and the RP-601 color ink-jet printer. Other manufacturers presented conceptual prototypes but made no marketing claims. All cameras were working with similar chips, approximately 250,000 to 500,000 pixel CCD (Charge-Coupled Device), and used the same storage disk (Mannheim, 1986).

Prices, as well as expectations, ran high. Canon's SV camera, 11mm-66mm zoom lens, and battery pack listed for $2600. They were really trying to attract the large corporate client, especially when you considered the $15,000 to $20,000 for a dedicated transceiver. A basic set-up of camera, playback and printer could be had for about $5,000 (Levine, 1989).

Canon U.S.A. gave Life magazine the use of a whole system including transceivers to tryout as a performance test for the Seoul olympics. After shooting, the photographer was able to hook up to a portable transmitter, pick his best choices, then call the east coast and send fast black-and-white renditions to his editor. After the editor made his selections, full color renditions were sent, each taking about 18 minutes ("The Future," 1988).

Public reaction was fast and enthusiastic (sometimes overly so). When Canon unveiled its SV system, Time magazine rushed to quote financial observers that it represented the "death" of photography as it had been known. Two years later, the 150th-anniversary-of-photography issue of Life magazine declared the VF "the future," which "will do away will film." But even before Life could get to print, there was a new format for high-band recording and a new standard for audio was added to the disk.

Sony was the vanguard of audio, and Fuji followed with the second talking disk, introduced in October 1988 at the Photokina show, again in Cologne. The audio/still disk can record sound bites a few seconds in length, with a corresponding reduction in recording space for pictures (Sutherland, 1989).

Boosting SV's resolution has become the industry's primary marketing thrust. Kodak, eager to perpetuate its standing as the U.S. photographic giant, is heavily immersed in R&D for far superior pixel quality and a new generation of related printers. Canon has already shipped its first Hi-Band SV camera, the RC-470, which is rated at 400 lines of horizontal resolution from a 380,000 pixel imager, compared to 360 lines in the RC-760 (which replaced the RC-701). At the recent National Association of Broadcasters convention, Sony brought its Hi-Band MVK-5600 recorder player, claiming video signals of 500 lines (Levine, 1989)

The three major players in this field are Canon, Kodak, and Sony, though others keep entering, most recently Panasonic. Canon had the first camera. Kodak and Sony introduced their systems without cameras in the expectation that ordinary video cameras would be used to capture images (Schubin, 1989).

The Sony ProMavica MVC-5000 is an improved SLR still video camera with interchangeable lenses for professional photographers that features a two-chip design using separate CCD sensors to record luminance and chrominance. A still video image is derived from luminance information, which determines image contrast, detail, and definition; and chrominance data, which establishes the color hues and saturation. A single chip camera only detects chrominance, and must use this signal to derive luminance. Users can opt for Sony's 9.5mm-123.5mm zoom lens or use one of several Nikon lenses that mount with a converter. This is much the same way that Canon offers a custom designed lens for its 700 series cameras or lets you select any of Canon's FD lenses by use of an adapter.

A number of helpful video features are also built in to the ProMavica, such as the video-out port that connects to a videotape recorder or monitor. The camera's shutter remains open when operating in the video-out mode so the photographer can preview the still picture on a monitor, or record full motion videotape. The camera is part of a complete SV system from Sony that includes the DIH-2000 Digital Image Handler, which tranmits and receives color video images in as little as 10 seconds. This whole Sony package can run upwards of $23,000 (Kliethermes, 1989). The MVC-5000 is clearly priced for professionals at $6,500, roughly the same as Canon's RC-760, their top interchangeable-lens camera.

Also targeted at the professional market, Panasonic Communications & Systems Company's Audio Video Systems Group recently introduced a system that includes the AG-ES10 VF camera, the AG-EP70 video printer, and the AG-ES100 VF player (Tuck, 1989). At the other end of the price spectrum is Canon's recently introduced consumer camera, the Xap Shot RC-250, which is priced at about $900. The Xap Shot is a field mode (50 exposures only) rangefinder with a fixed focus 11mm lens (euivalent to a 60mm on 35mm camera). It has a built in flash and records in the Hi-Band (HiVF) mode. The best feature is the playback mode, all you need is an RF adapter and you can plug right into a monitor. There is no need for a separate playback unit (Sweetow, 1989).

Storage System

The 2-inch still video disk, or video floppy (VF), was developed in the seventies and introduced by Sony with its Mavica system in 1981 (Sutherland, 1989). As with 8mm video, there is both an ordinary and a highband mode. Ordinary resolution is about 350 TV lines, HiVF is about 500. Vertical resolution depends on whether the images were recorded, in the frame or field mode (Schubin, 1989).

The frame mode records 25 dual-field interlaced, full-resolution images on a single disk. The field mode records 50 single-field, half-resolution images (Lewis, 1989). In general is possible to mix the two modes on a single disk, although some models, such as Canon's RC-701, only allow recording in the field mode (Sutherland, 1989). Each frame is broken down into two fields. One field contains the odd numbered scan lines and the other, even numbered lines. Put them both together and the result is a (relatively speaking) high resolution picture in the frame mode.

The VF drive is actually a two-headed mechanism which allows recording and playback of both fields simultaneously. However, when resolution is not critical and/or storage space is at a premium, a single frame can capture a lower quality image, which results in the maximum of 50 images per disk in the field mode (Lewis, 1989).

It is even possible to record audio on the disk. Sony's ProMavica MVC-5000 makes audio and data "memoing" available (Kliethermes, 1989). At 9.6 seconds of audio per image, its possible to record 16 frames or 25 fields on a disk. Recording audio only, eight minutes are possible (Schubin, 1989). The data memo is an automatic, graphic record of date, time, aperture value, and shutter speed for each picture. This information can be superimposed on the still image itself or stored on a different track (Kliethermes).

Analog vs. Digital

Contrary to popular misconceptions regarding the format, SV is not a digital medium. The confusion is somewhat understandable, after all, SV does use a computer like disk. But unlike a PC, the VF disk records an analog signal. On a digital computer disk, information is stored as hundreds of thousands of individual bits. They are separate and distinct. Each one is magnetized, and its polar orientation on the disk's surface determines whether they are interpreted as a one or a zero.

An SV disk on the other hand is more akin to audiotape or more precisely, a flat piece of videotape. The image stored on an SV disk is one long, contiguous signal of infinitely varying amplitude rather than the discrete, individual bits of ones and zeros recorded on a computer disk. However, unlike a VTR where both the heads and the tape are in motion, SV uses a stationary head under which the disk spins (which is one of the factors limiting image quality). Each still video picture is merely a single frame of videotape information.

Adding to the confusion of the two-inch format are recent announcements by some laptop computer manufacturers, who have expressed an interest in using it in their portable PC's. Employed in a PC, the disk would record digital information. Amplifying the misconception even furtherstill are the cameras themselves, which use digital CCD technology. The 300,000 plus pixel elements of the CCD chips in an SV camera digitally receive the image, however, much like a CCD video camera, this binary information is translated into analog information through an analog to digital converter before it can be displayed or stored. Thus the combination of digital imaging and analog archiving makes SV a hybrid system incorporating technologies from both the digital and analog domain.

Digital imaging provides a means of replication and editing an order of magnitude higher than anything we have in the analog world. With digital imaging, it's possible to process on a pixel by pixel basis, providing absolute control over image replication. However, this comes at great cost in terms of storage and the computational power necessary to display the image.

Consider the mathematics of digitally recording a full color image. If a CCD chip is capable of imaging approximately 300,000 pixels, and we need at least 8 bits of information to store color for each pixel, it would take 300,000 Kilobytes of computer RAM or disk space to store a single, medium quality image. The VF disk is capable of storing 1000 Kilobytes, so each disk would hold no more than three images. Sony's ProMavica system has the capability of digitally storing images on magneto-optical disk drive with their DIH-2000 Digital Image Handler, and it requires one Megabyte of space per image.

Not only would it take a big chunk of disk space, but that image would have to be stored in RAM before it could go to disk. Today's disk drives have nowhere the data through-put it would take to write an image directly disk in real time. Consequently, all-digital systems need multiple megabytes of RAM to capture, display, and manipulate color still images. This will eventually come to pass, probably sooner than later (Lewis, 1989).

Fuji has recently announced a system that images on an integrated circuit (IC), with the Fujix DS-1P digital still imaging camera prototype. There are currently many limiting and cost factors to be worked out, as the Fujix is projected to be more than five years away from production. The question of analog versus digital may be the most important single issue in the future of electronic still imaging, along with the final storage medium (DeBat, 1989).

Applications

Still Video is a technology in search of an application. Positioned as a replacement for silver photography at its introduction in 1986, SV is finally being accepted for what it is: an alternative method of imaging that fits into today's complicated multimedia image marketplace, workplace and school.

Even more exciting is the ability of SV to tie in with other electronic media. Images can be exported to computers and modified using graphics software; they can be combined with motion video, or transmitted from one location to another just like regular video. While it's certainly faster and arguably more convenient than conventional photography, there are limitations to SV.

For now, SV's greatest potential lies in applications that take advantage of its all electronic format. For instance, with a Panasonic system, you can take a picture with the camera and send it to to a computer to manipulate the image, then record it and present it on a monitor. Or you can use the printer to print a picture and use that to generate a slide. It can be used as an electronic slide or used to produce an actual slide. There is an interface adapter box that can control up to ten players, those can be linked together to control up to 50 players; all hooked into a computer to control a multi-imaging presentation easily. And if its on VF, it can be updated consistently at practically no cost. SV is ideal for computer data bases. Users can keep a photographic file on disk rather than by prints or slides.

Image transmission is where it all fits together. With a transmitter, pictures can be sent anywhere in the world over dial-up or leased phone lines. News organizations have been among the first to experiment with SV for exactly this reason. For example, during the recent student unrest in China, Sony SV equipment helped reporters get pictures to the outside world when satellite uplinks were cut off (Tuck, 1989).

Still Video is a technology that experts believe may eventually have a great impact on business communications, closing the gap between video and still photography. But relatively few corporate customers have yet been wooed by an admittedly still-evolving technology. Those corporations that have taken the SV plunge are putting the technology through its paces.

J.C. Penney uses Sony ProMavica cameras and transmission equipment to send a variety of ready-to-wear apparel designs from Dallas to factories in Singapore, Osaka, Taipei, Seoul, Hong Kong and Manila; and to receive photos of finished products from the factories. This has eliminated a two-week delay in important decision making (Levine).

Imtech International, a video wall company, uses Sony SV cameras and players to add to the immediacy of video wall presentations. They take candid SV shots of clients, their companies and products, then immediately display them on the video wall, creating a larger-than-life presentation that is simple yet powerful.

Another SV user is Ohio State University's College of Veterinary Medicine, the world's largest veterinary school. According to the Biomedical Media department, medicine is taught with images. Their department has produced 8,000 to 10,000 images per month for the last 18 years.

The school makes extensive use of slides for classroom instruction, as well as producing images for diagnosis and documentation. The school has accumulated an enormous pile of media. SV has provided the school with a way to help organize, store, and retrieve images more efficiently. The Biomedical Media department uses a Kodak video transfer stand to convert slides to video for storage on video floppies. A Kodak video printer is used to make quick copies from both video floppies and images captured from videotapes of surgeries and other procedures. Still video also allows the faculty to use images in new ways. For example, an SV recorder can be connected directly to an ultrasound machine, which uses high-frequency sound waves to take X-ray-like pictures of an animals internal organs. The quality of the SV images is superior to the paper prints formerly used. Instructors can also take the SV machines into the classroom and project images with a video projector. They find the VF disks more convenient than slides.

State of the Art Corp., a producer of presentations for business meetings, is one of the first companies to make extensive of SV for presentations. The company has been using SV since 1987 to create presentations for such clients as IBM, Travelers Insurance, J. Walter Thompson, and RJ Reynolds. State of the Art owns 18 SV record/playback decks, three cameras, two transceivers, and two printers, all Sony equipment. They use ProMavica products in conjunction with a TVL microcomputer-based animation system to create programmed video sequences for speaker support at technology conferences and business meetings.

When State of the Art pitched the RJ Reynolds account, one objection was distance: State of the Art is based in Manhattan and Reynolds is in North Carolina. During a meeting at the Reynolds headquarters, State of the Art photographed a Reynolds executive and used the Sony transceiver to send his image back to State of the Arts's facility. There, video artists added a title, text, and a background consisting of the RJ Reynolds logo. Within 10 minutes the completed image was relayed back to North Carolina and displayed on a sony monitor. The image was also printed out using a Sony printer.

A specialized product that provides an example of another use for SV is the Photophone from Image Data Corp. of San Antonio, TX. It sends SV images from one location to another in as little as 10 seconds and is intended mainly for teleconferencing. Sending full-motion video over telephone lines is a problem with existing technology because conventional phone lines can't handle the volume of information needed for motion video. Videoconferencing usually requires using satellite transmission, which is expensive. By sending still images and using special data-compression techniques, the Image Data system can use regular phone lines (Tuck, 1989).

Conclusion

After you weigh all the variables, you may conclude that a still video system is desirable. The decision, in a pragmatic sense, may be better based on which department has jurisdiction over given facilities rather than technical capability, as such. A media department may have engineers who can hook up anything, but an administrative department may still prefer the turnkey handiness of a still video disk. Or, rather than an either/or choice, a still video system may make sense as an adjunct to other methods of recording and storing electronic stills, all to be called up as required. The point is that "the future" consists of options, all of which belong to the user.

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A HyperCard Delivered Simulation for Training in the Administration of the WISC-R Block Design Subtest

Anthony Moon

Introduction

The purpose of this paper is to discuss the development of a visually oriented computer simulation designed to aid in the training of test administration students. The training was designed around the Block Design subtest of the Wechsler Intelligence Scale for Children - Revised (WISC-R).[1]

The simulation was designed in a computer-assisted instruction (CAI) design course and produced with HyperCard[2] using the Macintosh[2] in a subsequent micro-computer course. The design and development of the simulator was completed as part of the author's doctoral work in educational technology.

What follows is a general non-technical description of the test, an overview of test administration training, an exploration of the HyperCard simulation and its invitation to its users to work visually.

Test Background

The WISC was developed by Dr. David Wechsler in 1949 and revised (WISC-R) in 1974 (Aiken, 1976; Sattler, 1974). A traditionally utilized test of intelligence ("IQ" test) for children age six to sixteen, the WISC-R is comprised of five Verbal and five Performance subtests. The Block Design subtest is one Performance subtest. In each subtest, the subject is asked to answer questions, or to perform a task. The examiner records responses to each item on a printed form called a "Record Form." After administration is complete, the examiner scores the subject's responses against statistically normed criteria. While each subtest measures a different dimension of intelligence, all subtest scores are viewed as a whole to synthesize an intellectual gestalt of the person being evaluated.

In the Block Design subtest, the subject is provided a set of cubes which are red on some sides, white on some sides and half red and half white (triangles) on other sides (See Figure 1).

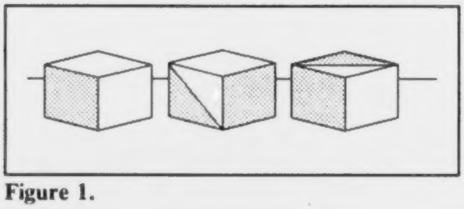

Figure 1.

The subject is asked to rotate the blocks to replicate designs from a small spiral bound booklet (See Figure 2) while being timed. The subject may manipulate the blocks in any way in order to replicate the design, and only needs to be blocks designs on the sides of the blocks are irrelevant for this task.)

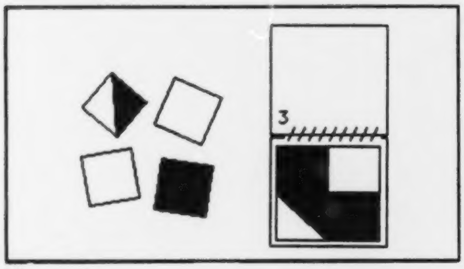

Figure 2.

In order to replicate the design, the subject must analyze what parts (red or white square, or red and white triangles) make up the whole design. They must then be able to visually synthesize the parts into a whole in order to reproduce the given design. Therefore, the Block Design subtest can be conceived of as a concept formation task involving both analysis and synthesis.

Of great importance to the development of the simulator is the issue of standardization. In order for the test results to be reliable, the WISC-R must be administered in strict adherence to the directions provided in the test administration manual. This standardization of test administration allows for uniformity of results among tests administered by any examiner. It is therefore critical that examiners be trained to respond to test directives in a uniform manner.

Test Administration Training

Typically, graduate psychology students are required to take several test courses. These courses are developed to acquaint the student with the theory of test development and the practice of providing, scoring and interpreting tests to assess intelligence, academic and psycho-motor skills, and personality traits.

In the late 1970's the author experienced such testing courses, and consequently served as a graduate assistant in the Wechsler Testing class. Students were briefed in test administration, and, in order to become proficient at it, were directed to find several subjects who would be willing to have the test administered to them. The verbal contract with each subject's parents was that the test would be given to their child, probably at their kitchen table, and often, as it occurred, while mom and dad watched TV in the adjoining living room (See Figure 3.) It was also agreed that test results would not be shared with the child or the parent due to the lack of standardization in the testing context, which would tend to negatively affect the reliability of the test scores. The aspects of this test situation which lacked standardization were the level of examiner experience and tendency for error; the examiner's prior relationship with the subject; and the inherent distractions for both the subject and the student-examiner in this informal testing context. The benefit was strictly to the test administration student -- to gain practice in providing the test.

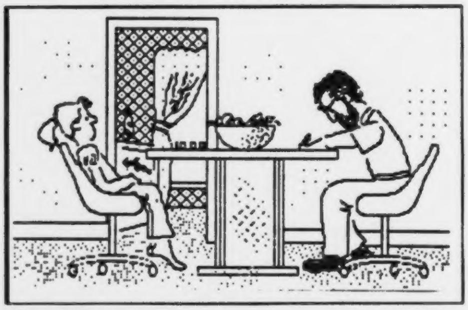

Figure 3.

The problems with this kind of training became obvious during graduate assistantship. There was no method to check for the standardization of administration beyond the written feedback on the Record Form. If a student chose, it was not difficult to literally fabricate an entire test administration. The problem of checks and balances was addressed to some degree by observing each student administer one test through a one-way mirror. Beyond this control, the degree of test administration standardization to which a student subscribed was largely unknown. In discussions with graduates of many different university testing courses, this is a common story.

The HyperCard Simulator

As an educational technology doctoral student, this author recently had occasion to develop and implement computer assisted instruction using the HyperCard program. For this project, the topic of WISC-R administration was selected. It was determined that the computer would act as the test subject, "responding" in a variety of ways typical of human test takers (See Figure 4.) The computer-subject responses are preprogrammed with human subject aspects of level of intelligence and personality in mind. The student-examiner performs most of the functions required in a live test situation with a human subject. For the student-examiner, these functions include determining correct beginning and discontinuance levels, accurate scoring and timing, and prompting the computer-subject with precisely delivered text.

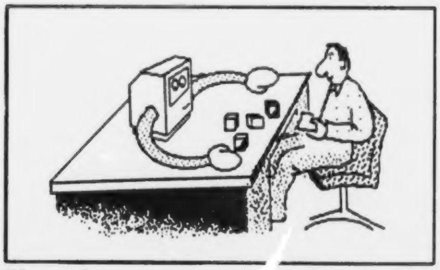
Figure 4.

The topic seemed to be a good fit with the medium, as text and graphics could both be used in the instruction. HyperCard also has the capability to run animation sequences which fit well with the actual testing situation in which the examiner observes the subject respond by arranging the blocks to match the stimulus card presented to him or her. The animation sequences would allow for students to practice their timing with stopwatches as well as observe what is being visually constructed.

The WISC-R Simulator addresses the following important issues: 1) It provides a student with an environment in which to practice and gain confidence in his/her test administration abilities before encountering live subjects; 2) It provides practice in physically transitioning between test manual, Record Form, design booklet, blocks and stopwatch; 3) It aids the students in recognizing starting and stopping levels; and 4) It allows the student to gain a visual familiarity with the block designs in the test. (See Figure 5.) Using the simulator, the student-

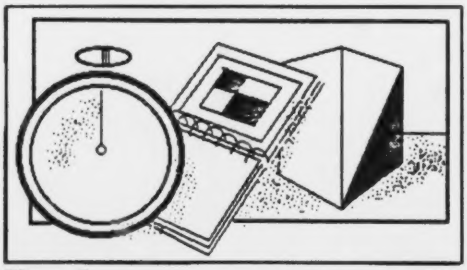
Figure 5.

examiners may begin to develop an ability to see how the subject views the stimulus card.

Working Visually

The WISC-R is divided into two groupings of tests: the performance subtests and the verbal subtests. The performance subtests rely heavily on psycho-motor and visual abilities, while the verbal subtests rely on verbal information and verbal processing.

In the Block Design subtest, the student-examiner is invited to work visually, to observe the subject's construction of the designs and to draw inferences from them. At the very least, the examiner is required to note if the design is produced correctly or not. Much information about the subject can be gleaned non-verbally from the subject's method of construction and from their failed designs. While failing will be important to establish the intelligence quotient score, *how* the subject failed will be important for diagnostic considerations, i.e., determining the perceptual and cognitive problems present and eventually planning for what can be done to correct them.

Block Design is an excellent subtest for observing the subject's methods of working. Anxiety, for example, may be revealed by excessive fumbling or by failure to check the pattern. Impulsiveness may be indicated by careless and hurried approaches to the task. Depression may be indicated by a particularly slow approach. Perhaps the child is persistent or gives up easily when faced with possible failure (Sattler, 1974). The child may be quick or slow, orderly, meticulous, or erratic and superficial. Possibly the child continues in one kind of approach, or alters the approach as the need arises. While some study the designs first, start with a plan and construct units of blocks and arrange them in proper relation, others may work in piecemeal fashion (Taylor, 1971).

In addition to observing the subject's methods of working, the student-examiner can also draw inferences from the subject's failed designs. Perhaps the subject constructs the design to represent only a portion of the stimulus design, ignoring the remainder of the stimulus design. The constructed design may utterly fail in its appearance to the stimulus design. The subject may accept the failed design as identical in appearance to the stimulus design. Maybe the constructed design matches the stimulus design, but is rotated diagonally. Each circumstance may prompt the examiner to begin to develop hypotheses regarding the subject's cognitive ability, compulsivity, guardedness, neurological impairment, or state of psychosis (Rappaport, et al, 1968). When linked with other data in the battery of examinations, the hypotheses may be proven or disproved. All of the above considerations can be noted with the computer simulation, as well as in live test situations with human subjects.

Conclusions

In this paper a brief overview of the Wechsler Intelligence Scale for Children - Revised was provided. Specifically, the Block Design subtest of the WISC-R was discussed. Of primary concern were the training issues of standardization of test administration and working visually: observing the subjects' methods of constructing Block Design patterns, developing hypotheses regarding the subject's level of anxiety, impulsivity, depression, organizational abilities, etc. Observing the constructed pattern may lead to hypotheses regarding the subject's cognitive ability, compulsivity, guardedness, neurological impairment or state of psychosis.

The HyperCard simulator appears to be able to meet the requirement of providing standardized training to ensure standardized test administration among test administrators. Because working with the simulator provides a low-risk situation, it invites its users to work visually to observe the methods used and the constructions made by the computer-subject.

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[1] In order to respect test security and copyright laws, actual WISC-R Block Designs are not utilized in this presentation. WISC-R is copyrighted by the Psychological Corporation.

[2] HyperCard and Macintosh are registered trademarks of Apple Computer.

High Definition Television: New Perceptual, Cognitive and Aesthetic Challenges

Nikos Metallinos

Abstract

The perceptual, cognitive and aesthetic principles governing the medium of television are decisively challenged by the advent of high definition television (HDTV) or improved definition television (IDTV). Established rules of visual perception, cognitive processes and aesthetic appreciation of television images of the past must now change to compensate for the high quality, film-like picture produced by HDTV.

This study focuses on the major adjustments that need to be made in perceiving, comprehending and appreciating the newly emerging technology of HDTV.

Introduction

The advent of electronic cinematography, defined by Mathias and Patterson (1985, p. XII) as ". . .a new form of production, born of the marriage of video hardware and film techniques," was an inevitable development of communication media technology. So confident were these authors in the development of the field of electronic cinematography, that they predicted that:

> The future of electronic cinematography lies in high definition television. When video images achieve a resolving power comparable to images recorded on 35mm film, electronic cinematography will begin to realize its full potential (p. 220).

For the most part, the predictions of these authors proved to be right, and, according to Carbonara (1990, p. 1), HDTV technology consists of:

> . . .five times the visual information detail {1.125 scanning lines} of pure NTSC {National Television Systems Committee, 525 scanning lines}, about ten times the color information, more than two times the horizontal and vertical resolution, great improvement in picture brightness, a wider aspect ratio {5:3} and sound quality that is equal to compact disc.

Due to technical, political and economic reasons, the mass application of HDTV technology has been delayed everywhere but in Japan where it has been in use for more than a decade. This could be a welcome sign considering the preparation and the consumer adjustment needed to meet the challenges of HDTV technology. The technical problems imposed by HDTV touch on the *production* of HDTV, the *projection* of images and the meas of *distribution* of HDTV programs. The political problems center on the issue of arranging a world-wide accepted standard for the transmission of HDTV programs. The economic problems have to do with the enormous amount of money required for the development of electronic cinematography, the production, and the distribution of HDTV programs as opposed to the limited funds required to produce regular 35 mm films (the estimated ratio is 5:1). The bulk of the research studies on HDTV and IDTV today center on various technical, political and economic issues. Very little has been done on the artistic, cognitive and perceptual ones.

In the view of some scholars and researchers, so much emphasis has been placed on these technical, political and economic issues, that the technology is already ten years behind in its proper development. Researchers at M.I.T.'s Media Laboratory have worked out an alternative solution to HDTV Technology and claim that they". . .can deliver those gorgeous HDTV-quality images within existing TV bandwidths by clever data compression and image improvement" (Brand, 1987, p. 75). In fact, the founder and director of M.I.T.'s Media Lab, Nicholas Negroponte, prophesizes that the future of HDTV technology will be even greater if we redirect efforts towards computer generated HDTV pictures which can go beyond 1.125 scanning lines (Rice, 1988, pp. 62-71).

Regardless of the means of transmission (regular broadcast or computer image compression), when the outstanding technical, political and economic problems are resolved, the new technology imposes some challenges for today's producers and researchers.

The existing perceptual, cognitive and aesthetic principles governing the medium of television are fundamentally challenged by the advent of cinematographically produced high quality, film-like images which are transmitted by television. Some well established rules and practices of visual perception, some bases which television viewers decode and recognize television images, and some guidelines by which television pictures are structured in order to be appreciated must now be altered due to new electronic cinematography technology. This study examines these changes and points out the adjustments that must be made to meet the challenges presented by HDTV.

Changes in the Perception of HDTV Pictures

Such perceptual variables as (1) life-like pictures, (2) aspect ratio, (3) screen size, and (4) frame rate, are among the most significant factors found in numerous empirical research studies coming from Japan (where the technology has been in full swing for more than a decade) (Takahashi, 1982), from Canada (Conway, 1988; Cook, 1990; Hearty, & Phillips, 1988). and from the United States (Mathias, & Patterson, 1985).

Unquestionably, HDTV or IDTV pictures are superior to those of the NTSC (National Television System Committee), PAL (Phase Alternation Line) or SECAM (Sequential Couleur à Memoire) systems. Such picture clarity, however, has caused concern to some researchers. They contend that in HDTV pictures, detailed and unnecessary visual elements—third level visual information—can assume a prominent role—first level visual information—disturbing rather than enhancing the visual communication process (Fleischmann, 1990; Metallinos, 1990) if the priorities of the visual information are not predetermined.

Empirical studies conducted in Japan by NHK (Nippon Hoso Kyokai), the Educational Television Network, have determined that HDTV pictures are better perceived by a wider screen aspect ratio (preferably 5:3) than the conventional 4:3. This is confirmed by Mathias and Patterson (1985, p. 224) who state that

> Studies indicate that the impact of wide-screen images results from the fact that the wide format doesn't allow the viewers to take in the whole image in one glance. It requires them to scan the image with their eyes and edit it into a visual experience. The fact that the viewers must participate in their visual experience tends to involve them more fully.

Limited experimental studies on the perceptual impact of screen size in HDTV confirms that the larger the screen, the better. Apparently, the full potential of a big-resolution image is better recognized on a large screen (Mathias, 1985, p. 224). This perceptual factor has additional implications in other areas such as picture construction, recognition and application.

Another perceptual factor which challenges HDTV viewers is the rate at which the frames or pictures change to create the illusion of motion. In general, the higher and the more frequent the ratio at which frames change, the better the resolution of the picture. The adoption of HDTV requires a higher frame rate in order to avoid flickering and "promote better rendition of Movement" (Mathias, 1985, p. 225), and to reduce the possibility of noise. Ordinary NTSC (a 525 line, 30 frame per second system) and PAL or SECAM (both 625 line, 25 frame per second systems) television viewers are not accustomed to these higher frame ratios. and a period of adjustment will be required.

Changes in the Cognition of HDTV Pictures

Scientific research on the cognitive effects of HDTV in North America and Europe are very limited—almost non existent. From general research on technology imported from Japan, the emphasis is placed on such factors as (1) the overwhelming picture resolution, (2) the increased size of the TV screen, and (3) the entertainment value of the new technology.

In commenting on the cognitive impact of the picture resolution, Behrens (1986, p. 42) explains that minute details like, for example, the list of ingredients printed on a can of soup, overwhelm the viewer whose eyes capture things never before seen on television or details which were never intended to be of any visual importance.

Mark Fleischman (1990), commenting on the issues raised by HDTV and IDTV regarding their use of bigger screens, suggests that the issue of acceptable size is related to the issue of viewer acceptance and understanding of the visual image projected by such TV set technology. It will take some time before NTSC, SECAM or PAL TV viewers readily adjust themselves to watching larger TV screens. An image presented on a small screen does not have the same cognitive value and is not understood or appreciated the same as on a larger screen. Screen size is a determining factor in comprehending the semantic meaning of televised messages.

Several observers of the cognitive effects of HDTV have speculated that television programming which is not made solely to enhance the technology, viewer comprehension, and appreciation will not be accepted. Winner (1980, p. 20) asks:

> Do we need a better image of the graying hair of the stars on "Dallas"? Clearer shots of the blood on football players' jerseys? A more intimate view of Morton Downey's toothy snarl? If our society absolutely must spend billions on television during the next several decades, improving the quality of programming would seem a better place to start.

Levy (1989, p. 100) goes even a step further. He believes that HDTV will not only develop its own programming to feed the viewer's hunger for better home entertainment, but that technology will have a profound effect on the movie industry as well. He predicts that "We'll see an incredible increase in special effects, and films will more easily be able to portray fantasy." Improvement in the programming of the movie industry and creation of special programming for HDTV are both cognitive factors which will challenge the future viewer of electronic media.

Changes in the Aesthetics of HDTV Pictures

The greatest challenges faced by the new technology will be in such widely practiced aesthetic principles (theories, concepts, rules and constructs) as (1) hot (film) vs. cold (TV) media, (2) horizontal (film) vs. vertical (TV) staging techniques, (3) small (TV) vs. large (film) visual fields, etc., to mention only a few.

Prior to the development of HDTV, students of television production, television criticism and television aesthetics full-heartedly embraced McLuhan's hypothesis of hot and cold media (1964, p. 37):

> There is a basic principle that distinguishes a hot medium like radio from a cool one like the telephone, or a hot medium like the movie from a cool one like TV. A hot medium is one that extends one single sense in "high definition." High definition is the state of being well filled with data. A photograph is, visually, "high definition." A cartoon is "low definition," simply because very little visual information is provided.

Partly due to the low quality (low definition) of TV pictures, and partly due to the small size of its visual field (the TV screen), television adopted the practice of using extreme close-ups in dramatic television to more intensely involve the viewer. Due to the advent of HDTV (which reverses McLuhan's TV aesthetic hypothesis) this will no longer be the case.

Another change resulting from the development of electronic cinematography is the difference in staging techniques adopted from the media of film and television. Until now, it was theorized that, in order to enhance the illusion of depth of the small visual field of the low definition television picture, visual elements should be composed within the Z-axis, moving inwards or outwards, either towards or away from the center of the screen (Zettl, 1990, p. 193). It was further theorized that the small opening of the regular TV screen does not allow the composition of crowded scenes and shots of landscapes. Such scenes were deemed more appropriate for the larger high definition film screen. These theories are now fundamentally challenged and must be adjusted with new aesthetic rules of HDTV.

Aesthetically speaking, the composition of visual elements within the small view offered by the ordinary home television set is much different than the composition of visual elements within a larger screen area. In addition to changes in framing and shot selection, there will be environmental changes of scenery, sets, props and the like. According to some speculators, not only will the new HDTV set be larger, but the entertainment center in the home will have to change. According to Levy (1989, p. 100):

> Unlike regular television, a tiny box in a room, HDTV cannot be ignored. Who can read a magazine in a movie theatre? Ultimately. . . the whole experience of watching television is going to be different. It will be a cinema experience.

These are only some of the most obvious challenges which the electronic cinematography of HDTV and IDTV are bringing into focus. There are, undoubtedly, a great number of hidden and unpredictable changes that we will experience when this technology will reach massive application in the not to distant future. It is, therefore, important that we keep informed through vigorous and systematic study and constant experimentation on all aspects of this new technology—not only technical but artistic as well. Otherwise, we may very well take the wrong turn (as has happened in the past) in developing and marketing this new visual communication media technology.

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Designing Instructional Materials Using Desktop Publishing Software: White-Space Variations, Perceptual Organization and Learning

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The proliferation of powerful personal computers along with improvements in desktop publishing software have revolutionized the printing and publication process. Now even a novice can use a range of techniques which were formerly available only to professional layout artists. As powerful desktop publishing programs become easier to use and more affordable in price, more people are designing and producing their own instructional materials by transforming existing art into professional quality work that can be pasted into a variety of text formats. By doing their own work, people are able to realize considerable savings and time, thus gaining the opportunity to provide a type of instructional material that was expensive, impractical, or inaccessible to them under previous conditions.

New desktop publishing enhancements offer a variety of graphic and text combinations. Clip art, photographs, technical illustrations, and so forth can be inserted into a variety of text formats. Three sophisticated computerized text formats which have been made available recently to consumers and are used to market the desktop publishing software include run-around text, wrap-around text, and transparent text. Run-around text is boxed around the graphic and has straight borders (see Figure 1). Wrap-around text conforms to the shape of the graphic and has irregular borders (see Figure 2.) And, transparent text is that which has a graphic placed directly over the text (see Figure 3). Examples of all three formats can be found in consumer magazines, newspapers, and instructional materials.

Unfortunately, many people who produce instructional materials with desktop publishing techniques have little or no training in instructional development, page layout, or graphic design. People who use such computer software to design instructional materials are faced with a vast array of newly developed features with little or no guidelines for their effective use. Even when guidelines are provided, they are often confusing. Although we have seen many nicely designed materials, we have also seen many pieces in which the text seems to be obscured by the graphic placement. Teachers and trainers have questioned the effectiveness and instructional impact of graphics which are inserted at whim and are asking for guidelines for their effective use. This research helps provide such guidance.

BACKGROUND

Text variables and graphic design have received attention in four basic areas of research: graphic design, instructional text design, instructional graphics, and, in recent years, computer design of materials for on-screen or printed material.

Research on graphic design emphasizes the importance of balancing text with white space, improving the aesthetics of the page, and positioning graphics as the dominant visual element (Parker, 1987). Such research does not usually question the content of the graphic. And, research in the area of reading indicates that the type of graphic is an important variable in reading comprehension, but that most students don't attend to the graphics (Reinking, 1986). Simple graphics at the pictorial level might not make a difference in reading speed or comprehension, but graphics which are designed at the inferential, generalized, and evaluative levels of understanding can help students grasp the meaning of the text (Reinking, 1986; Singer & Donlan, 1980). Further, research on learning suggests that designers should address cognitive processes by developing materials for graphic thinkers, not just graphic readers (Boyle, 1986).

Recently, principles for text design have been developed for use by instructional designers (Hartley, 1985; Heines, 1984; Jonassen, 1982). Layout is one variable which significantly affects readers' speed and comprehension. But the layout variables in text research (type style, upper-lower case, character attributes, line length, and justification) do not address the question of graphic content or placement. There is a dearth of reported research on graphic placement in instructional text which can influence guidelines for the emerging capabilities of new computer software programs (Isaacs, 1987; Knupfer & McIsaac, 1990a).

Instructional graphics research reveals no empirical evidence that the use of graphics in instruction improves learning, but the graphics used in that research might have represented concepts already familiar to the readers (Merrill & Bunderson, 1981). More sophisticated instructional graphics, such as pictorial, symbolic, schematic, or figurative displays, can be effective in teaching, and the visualization of abstract ideas through figurative displays may very well enhance learning (Nygard & Ranganathan, 1983).

Research that compared reading comprehension using computer screen versus printed text revealed nonsignificant differences (Gambrell, Bradley, & McLaughlin, 1987). Despite the similar result concerning comprehension, students reported more difficulty reading from the computer screen than from printed text; one variable which caused this difficulty was fatigue (Hathaway, 1984; Mourant, Lakshmanan, & Chantadisai, 1981). Even though research on electronic and printed-based materials have their own specific variables, certain features apply to both, including text density, upper- and lower-case, and typographic cueing (Hartley, 1987; Hathaway, 1984; Morrison, Ross, & O'Dell, 1988; Ross, Morrison, & O'Dell, 1988).

Several researchers have investigated layout, typographic cueing, and representation of graphic material in print-based text. Hartley (1985) determined that page size affects other layout decisions. Some studies that have compared the effects of justified and unjustified text on reading speed and comprehension found no significant differences (Campbell, Marchetti, & Mewhort, 1981; Muncer, Gorman, Gorman, & Bibel, 1986), yet the issue remains unresolved (Jonassen, 1982). Jandreau, Muncer, and Bever (1986) have investigated the effects of varying spaces between phrases in sentences. Still others have examined certain design features common to printed and electronic text in the presentation of graphic materials (Alesandrini, 1987; Poggenpohl,1985; Winn,1987; Winn & Holliday, 1982). Hartley (1987) and others have requested that such research be done.

Knupfer and McIsaac (1990a, 1990b, 1989a, 1989b) investigated the effects of various wrap-around enhancements which were produced electronically for print-based materials. They found that the wrap-around text placement produces faster reading time and better comprehension than the run-around text placement (1989a). Further, when comparing the use of the wrap-around text format, with variations in the amount of white space between the graphic and the text, they found a trend but no significant differences in reading speed or comprehension between text that was

FIGURE 1
Run-around Text

In 26 words or less, HyperCard is "an innovative data handling environment. HyperCard lets you put information in stacks of index cards, then easily link elements of the data in amazingly complex ways" (Keith Thompson, *InfoWorld*, October 5, 1987). This brief description is accurate, but does not begin to explore the scope of HyperCard's capabilities. For example, the data that you manipulate can be text, graphics, synthesized or digitized speech, or the contents of a CD-ROM or videodisc. You can gain access to these data with the click of a mouse button, and you can move through millions of bytes of information in a matter of seconds. And unlike other traditional databases, HyperCard does not restrict you to linear-sequential organization. You can bound through your data in any way your heart desires by clicking on predetermined text, graphics, or buttons.

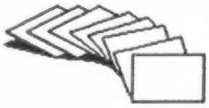

FIGURE 2
Wrap-around Text

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FIGURE 3
Transparent Text

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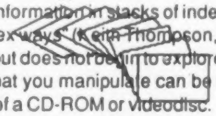

placed very close to the graphic and text that was placed further away from the graphic, showing 1/4 inch of white space (1990a).

Although certain features of electronic text can be transferred to printed text, there are many differences between the two which suggest that separate studies be done. The size of the screen or page, the type size and the ability to scroll are but a few of the differences which affect print and electronic text comparison studies. Because of these differences, a programmatic series of investigations is needed to examine the effects of these recent technological enhancements in each of the two media formats. Recent work by Morrison, Ross, and O'Dell (1988) examines attributes of computer based instruction, and attempts to affect these attributes by regulating text density for print and screen display lessons. Results suggested that print had more advantages than the computer screen in achievement, completion time, and learning efficiency for a statistics lesson. Therefore, the present study is limited to the examination of print-based computer-generated text.

PURPOSE

Graphic designers have long emphasized the importance of using white space for balancing text, positioning graphics, and improving the aesthetics of the page layout (Parker, 1987). However, few attempts have been made to examine how the shape and amount of white space between the graphic and text enhances the visual without adversely affecting comprehension of the reading material.

The purpose of this study was to investigate previously noted trends (Knupfer & McIsaac, 1990a, 1990b, 1989a, 1989b) in order to discover the point at which the white space interferes with reading speed and comprehension. This study utilized only the wrap-around text format and compared the effects of variations in white space surrounding the graphic. Wrap-around text with no white space around the graphic (see Figure 2) was compared to wrap-around text with one-half inch of white space between the graphic and text (see Figure 4). A third group which contained no graphic at all was used as a control (see Figure 5).

Based on the principles of perceptual organization, which include similarity, proximity, continuity, and closure (Bloomer, 1976) we speculated that the amount of white space surrounding the graphic would affect reading reading speed and comprehension. These four processes, by which the mind organizes meaning, depend on how physically close the objects are, how similar they are, whether there is a continuous line to guide the eye, and whether the minimal amount of information is present that is necessary to obtain meaning or closure. Reading speed and comprehension are directly affected by the way the mind organizes meaning from the placement of graphics and text. In particular, the principle of proximity states that the closer two or more visual elements are, the greater is the probability that they will be seen as a group or a pattern. Further, the critical nature of horizontal space between visual elements influences the interpretation of the meaning of those elements (Zakia, 1975). Based upon this information, this study tested the hypothesis that reading speed and comprehension would be significantly greater when text was wrapped tightly around the graphic than when it had one-half inch of white space surrounding it.

METHOD

Subjects

One hundred, twenty-eight students from an introductory computer literacy course at a major university in the Southwest participated in this study. The elective course was an upper division course which was offered to meet a General Studies numeracy requirement. Students were sophomores, juniors, and seniors who had very little or no prior computer experience. This study was conducted at the beginning of the semester before the students encountered the information

FIGURE 4
Wrap-around Text with One-Half Inch White Space

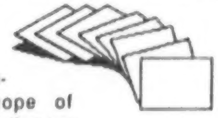

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FIGURE 5
Text with No Graphic

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presented in the textual material. All students in the course participated in the study.

Materials

Readings. Readings included approximately six pages of informative text about Hypercard and desktop publishing. These materials were chosen because the topic was relevant to the subjects and because the reading level was geared for the general public as opposed to technical readers. The topic was suited to a novice audience with no prior knowledge about either Hypercard or desktop publishing. The text was analyzed using the Flesch-Kincaid Readability formula and was found suitable for college students between the 11th and 13th grade levels.

Three sets of reading materials were used for this study. All included the same text arranged in single column format. Set one did not contain any graphics at all. Sets two and three each contained 12 identical graphics which were placed in the text using the wrap-around technique. The only difference between sets two and three was the amount of white space surrounding the graphics. Set two had no white space between the graphics and text, while set three had one-half inch of white space between the graphics and text. The simple, pictorial graphics were meant to be motivational and were linked to the text by interest. Even though they were not critical for the understanding of the textual material, the graphics very well could have promoted understanding through illustrative associations.

In the hypercard article, the graphics included a Macintosh computer with a set of linked cards on the screen corresponding to an introductory paragraph describing hypercard and the machinery it runs on, a stack of index cards representing Hypercard's index card analogy, a set of books representing computer manuals, an organizational chart representing the five levels of hypercard application, an educator sitting at a computer representing Hypercard's impact on education, a teacher and an administrator discussing the potential of Hypercard in schools, a set of computer disks representing Hypercard's impact on new software development, and finally, a newsletter and newspaper set representing the important evolutionary step in computing attributed to Hypercard. The desktop publishing article displayed a desk to represent the desktop publishing concept, a hand on a mouse where the text explains that various desktop publishing programs support mouse usage, and a set of black and white tack pins representing the concept of the same yet different, to coincide with the text's explanation concerning variations in the same desktop publishing software to accommodate the MS-DOS and Macintosh environments.

Although some professional layout designers might question the graphics placement within these reading materials in terms of the elements of good design, it is important to know that the way in which the materials were developed is indicative of common practice among lay people. Therefore, any flaws in the materials design are potential problems that other teachers and trainers might exhibit as well.

Pretest and Posttest. To measure the students' comprehension of the reading material, a pretest and a posttest were developed from key concepts which the authors extracted from the readings. No test items were dependent upon the information contained in the graphics. The tests were developed and validated during a previous phase of the project, and were found to be reliable at the .76 level using the KR20 formula. The pretest and posttest were nearly identical; each contained the same 34 multiple choice and 11 completion questions utilizing the fill-in-the-blank format. The two types of questions measured both recognition and recall comprehension skills. In addition to those questions, the two groups with graphics were asked to recall as many graphics as possible on the posttest. They were told that there were 12 graphics to recall.

Procedure

All subjects were given a pretest to determine their knowledge of the subject prior to reading. There was no time limit and students were free to take the time they needed to complete the test. Next, the three sets of reading materials were randomly distributed to the students so that each student received one set of articles. Students were instructed to read through the text one time without hurrying. When subjects were finished reading, each of them recorded their time from a master timekeeper which posted times to the half second. Proctors observed the students to make sure that their times were recorded correctly. Immediately following the reading, the subjects were given the posttest. They were allowed as much time as they needed to complete the test.

Analysis

Comprehension was measured by the gain calculated by subtracting the pretest score from the posttest score. Analysis of variance (ANOVA) was conducted on the three groups. Independent variables were the text-graphic format (no graphics, wrap-around text with no white space, and wrap-around text with one-half inch of white space). The dependent variables included reading speed and comprehension. A t-test was conducted on the graphic recall question for groups two and three. The alpha level for significance was set at .05.

RESULTS AND CONCLUSIONS

Significant differences in comprehension were found between the groups. Subjects in group three, with one-half inch of white space between the graphic and text, comprehended significantly less than subjects in group one which had no graphic, or group two which had no white space between the graphic and text. There were no significant differences in reading speed between the three groups. Table 1 shows the mean comprehension scores for the pretest and gain, for each of the treatment groups. Table 2 shows results for the one-way ANOVA for comprehension between treatment groups.

We venture to guess that the lower mean comprehension score on for group three reflects the principal of visual perception called proximity; it is more difficult for the eye to follow the text and perceive meaning due the larger gaps that the eye must jump across to continue reading. Further, it agrees with Zakia's (1975) claim that the horizontal spacing is critical to accurate perception.

Table 3 shows results of the t-test between groups two and three concerning recall of the 12 graphics. There were no significant differences between the two groups based upon the amount of white space surrounding the graphic. The low mean scores indicate that neither group remembered very many of the graphics. This, along with similar reading speed between the groups, supports Reinking's claim that readers do not really pay attention to pictorial graphics (1986) .

Based upon the findings of this research and our past research on this topic (Knupfer & McIsaac, 1990a, 1990b, 1989a, 1989b), we recommend that people who place graphics within text using desktop publishing software either use no graphics at all or use graphics which use the wrap-around text as opposed to the run-around, boxed style of text wrap. Further, when using the wrap-around text format, limit the white space between the graphic and text to less than one-half inch.

It is possible that reading speed and comprehension using these text-wrap configurations could vary dependent upon the type of graphic used. Therefore, we suggest that future research be conducted using a variety of graphics, including those which are more critical to the meaning of the text.

TABLE 1

Reading Pretests, Gains, and Times

Means and Standard Deviations

		Pretest		Gain		Time	
Group	n	M	SD	M	SD	M	SD
No Graphic	44	7.09	6.15	33.04	12.52	9.86	1.98
Wrap Tight	44	6.04	5.79	32.18	14.69	10.54	1.98
Wrap 1/2" White	40	7.85	7.32	24.40	11.87	10.27	2.24
All	128	6.96	6.41	30.04	13.57		

TABLE 2

Summary of ANOVA

Reading Gain by Format

Source	D.F.	Sum of Sq.	Mean Sq.	F Ratio	F Prob.
Between Groups	2	1871.66	935.83	5.43	.005
Within Groups	125	21532.05	172.25		
Total	127	23403.71			

TABLE 3

T-Test

Graphics Recall by Format

Group	n	Mean	SD	SE	F Value	2-Tail Prob.
Wrap Tight	44	1.27	1.66	0.25	1.17	0.61
Wrap 1/2" White	40	1.57	1.53	0.24		

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" ARTS "

The Anatomy of "On-Air" Television Fundraisers

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Introduction

It has been said that television is a moving force in today's society. In less than some forty odd years, the television industry has gone from providing a curious luxury to a commonplace necessity in nearly every home in America. In support of this thesis, Singer & Singer (1983) stated that the American school aged child spends more time in front of the television than in the classroom. Clearly, 98.1 percent of all households are television households (Nielsen cited in Facts about PBS, 1989). Foley (1989) stated that the number of television homes has grown at an average rate of two percent per year since 1980. Broadcast television advertising volume expanded at an average rate of 12.1 percent during the first half of the 1980's, well above the 7.9 percent annual growth in the gross national product (Bortz, Wyche, Trautman, Bortz, & Coddington, 1986).

Television has the ability to entertain, motivate, inform, and educate. It has the ability, as does any well used medium, to change viewer attitudes. Television is clearly one of the many factors causing rapid changes within many of the Soviet bloc countries. Whereas the printed medium can be kept out of a country, governments find it difficult, if not impossible, to block the airwaves and thus the messages carried on them. Viewers in these countries are "exposed" to new ideas, fashions, and products and are motivated to actuate change from within.

Types of shows

The ability of television to change societal values is seen daily in many different genre of shows. Although the relative quality of many television shows has been questioned, several "entertainment" shows (such as the ever popular *The Cosby Show*) have ventured to offer both entertainment and message for viewer consideration. Clearly, the role of the many offerings seen on PBS has been to change attitudes, inform, educate and entertain. Whereas commercial advertising is designed to sell products, while news and feature shows are designed to inform and educate.

Television as a marketing tool

Television is not only a business in and of itself, but is also a tremendous marketing tool for other industries. Mostly, advertising on television consists of the "traditional" advertising commercial, that is, a product being sold to the consumer through the use of a spokesperson and product. It is the advertisers bet that the consumer will choose the advertised product over the product of a competitor upon the next appropriate shopping occasion. Very few advertisers expect the consumer to make instant decisions which will cause them to purchase their product. Although many commercials are "timed" to arrive in our homes during vulnerable moments (pizza that can be delivered in minutes, for example) most advertisements are designed to affect long term change in viewer attitudes toward a particular product. "On-air" television fund-raisers, on the other hand, rely on their ability to make the consumer get up during the program and go their telephone to support a particular cause, or to buy a particular product.

Purpose

The purpose of this paper is to present three different types of "on-air" fundraising techniques, their audience, and their individual design characteristics. Prominent to the discussion will be a description of the fund-raising technique and an analysis of why each technique is successful. Although several examples of "on-air" fundraising can be identified, three basic types will be discussed: health related telethons, "for profit" non-traditional commercial advertising, and public television fundraising telethons.

Health related telethons

For many years, actor/comedian Jerry Lewis has been coming into homes each Labor Day to ask viewers to support the Muscular Dystrophy Association. Each new year has seen Lewis raise an ever increasing amount of money for "Jerry's Kids". Hundreds of millions of dollars are raised for the cause, which is highlighted each year by Jerry's televised "marathon session" telethons. Other health related causes have seen the success of the Lewis telethons and have tried to copy it. Many, such as Easter Seals, have been successful with their offerings, and new causes appear annually.

Traditionally, the telethons are centered around prominent spokespersons who give of their time to perform musical and comedy acts that are intertwined with the call for financial support. The telethons usually last no more than 12-24 hours and only happen once each year. The look of the show is most likely "glittery" and designed to invoke immediate as well as long term attitude change.

Non-traditional commercials

Commercial advertising has traditionally been inserted into several two minutes slots within the normal body of a regularly scheduled program. Recently, however, more and more "non-traditional" advertising has been seen popping up on the American tube. One brand cleverly disguises itself as a traditional show, usually of the talk show variety, and then proceeds to sell a product under the guileful eye of a "host". This "host" appears to take a neutral stand while the show's "guest" demonstrates the amazing qualities and abilities of their product. This "show" even has commercials which, of course, are more traditional looking commercials for the product being talked about. To the unsuspecting viewer, this type of advertising could be misconstrued as a show sanctioned by the network. The shows are most likely seen late at night and always have disclaimers by the station on which they air.

Another brand of non-traditional advertising uses the telethon approach to sell a product during the showing of a popular movie. The advertiser purchases every commercial slot during a movie and, in effect, becomes the "sponsor" of that show. The paid celebrity spokesperson interrupts the show after a lengthy opening sequence (usually 45 minutes), and only sells the product (traditionally home siding) for a very brief few minutes. The movie is then allowed to run for a shorter period of time when the spokesperson interrupts for a longer selling session. This cycle of shortening the movie and lengthening the advertisement is followed throughout the movie. This technique usually causes the last few minutes of the movie to take a much longer time than traditional movies. By the time the viewer realizes that the interruption times are greater and movie times are fewer he is thoroughly hooked into watching the movie and thus the product being sold.

The commercials traditionally have a "telethon" look and most always feature "operators standing by to take your call". The spokesperson talks of protecting your family and saving you money. They point out that their offer is good "only during this show" and urge the viewer to get up from their seats to "make that call now". Unlike the health related fundraisers, these shows appear throughout the year and last for only a few hours when aired.

Public television fundraising

The Public Broadcasting Service (PBS) was founded in 1969 as a private non-profit corporation whose members are the nation's public television stations. 172 noncommercial, educational licensees operate 337 stations serving the U.S., Puerto Rico, the Virgin Islands, Guam and Samoa. Of these 172 licensees, 48% are affliated with community organizations, 33% colleges or universities, 13% state authorities, and 6% local, educational, or municipal authorities (Facts About PBS, 1990, p.2).

One commonly cited reason people give for watching public television is that the PBS stations do not have traditional advertisements to supplement their operating budgets. Money for public television is derived from a number of sources but must also rely upon viewer support for continuance. Public television's total national, regional, and local income in 1989 was in excess of $1.22 billion with approximately four-fifths (83%) of the funding coming from nonfederal sources, namely subscribers (21.6%) state governments (18.9%) and businesses (16.1%).

Public television "festivals", as they are often called, are arranged around a national schedule, with all PBS affiliates going to the viewer for support at roughly the same time. Although PBS coordinates the national schedule, individual stations are allowed to format the look of their offering. The national coordination is accomplished through the Station Independence Program (SIP). SIP provides special programming along with advertising and promotional materials, premium information, marketing research and statistical analysis to enhance a member station's on-air fundraising.

Local and state-wide public television fundraisers traditionally use as spokespersons a combination of local and state-wide celebrities as well as members of the paid station staff. The fundraising pitches are inserted into the body of specially purchased programs designed to attract larger viewing audiences. These packages are often intended to attract viewers who do not normally watch a PBS channel. The festival usually revolves around a twice yearly ten to fourteen day schedule with a majority of the "on-air" pitches occurring during prime-time viewing hours.

Reasons for pledging

Research has shown that viewers of fund raising presentations may choose to give to any particular cause for a variety of reasons. Many viewers are motivated to give or buy in an effort to satisfy one of their felt, established, or anticipated needs. Many, on the other hand, are motivated to give or buy in response to their decision making style. Most fund-raising efforts incorporate these motivators into the verbiage (commonly called "pitches") of the event.

A needs hierarchy

Maslow (1968), for example, outlined a needs hierarchy that has not only been used to discuss psychological motivation but also has been used to structure the various forms of fundraising for television. Maslow's hierarchy is a progression through, and satisfaction of common human needs-- physiological, safety, love, esteem, and self-actualization. Appeals to these needs are often embedded in rationale given to convince viewers that they should give to a particular cause. Most fund raising pitches are centered around this Maslow type needs approach and can be demonstrated by examples of actual pitches used in a recent PBS festival (Chalmers, 1990). Definitions of the need and actual pitches follow:

1. Physiological needs (the most basic of needs, concerned with acquiring or retaining those things necessary to "sustain the life of the organism")

   Actual pledge pitches:
   a. "Public television can't survive without your support."
   b. "Don't let (this station) die, pledge now."
   c. "Without your pledge, it's like you're trying to survive without oxygen or water."

2. Safety needs (protection oriented, concerned with nurturing, sheltering, defense against danger or threats, designed to prevent harm)
   Actual pledge pitches:
   a. "Public television is a cause that needs your support."
   b. "Your pledge will insure our future."
   c. "Your pledge is an investment in Channel XX's security."

3. Love/Acceptance needs (peer pressure or need to be accepted, relates to things people do to gain or maintain respect from others)

   Actual pledge pitches:
   a. "You'll be joining a very special group of concerned supporters."
   b. "You'll be recognized as someone who cares about..."
   c. "By contributing to (XX) you'll be demonstrating that you care, come on, join the family of..."

4. Esteem/Pride needs (relates to things people do to feel good about themselves, to achieve a sense of pride)

   Actual pledge pitches:
   a. "You'll feel really good just knowing that you're doing your part..."
   b. "You'll be proud of your support and so will your entire family..."
   c. "Some things you do because you know they're the right thing to do."

5. Actualization/Self needs (relates to activities or pastimes which represent values realized, a personally uplifting experience leading to a sense of self-satisfaction or self-worth.

   Actual pledge pitches:
   a. "When you see the ballet, it's like being there yourself."
   b. "You have the best seat in the house, your seat.."
   c. "When you support Public television, you're expressing yourself in a most important manner." (Chalmers, 1990, p. 12)

Decision making style

Many viewers are convinced to give based upon their decision making style. Chalmers (1990) outlined four decision making styles that might impact on whether or not a person agreed to make a contribution during a pledge drive. Those styles-- task oriented, people oriented, support oriented, or facts oriented each have unique characteristics that can be appealed to. Examples of those decision making styles and actual pitches from the recent festival of a PBS affliate follow:

1. Task oriented (convincing the viewer to do something because it is a job that needs to be completed)

   a. time conscious ("We'll take just enough time to tell you how you can help...")
   b. seek efficiency ("There's no hassle. One phone call and we'll make it easy for you.")
   c. need to be productive ("Your pledge will be used to keep more programs coming your way.")

2. People oriented (convincing the viewer to something through people he associates with)

   a. Relationship conscious ("Public TV can't survive without people... and their financial support.")
   b. Work through people ("You've seen the mayor, the school board president, a movie star, now we need your support. Won't you join them?")
   c. Need recognition ("You'll carry the tote bag with pride and everyone will know you're a Channel X supporter.")

3. Support Oriented (convincing a viewer to do something because it will support a cause)

   a. Feelings oriented ("A lot of people work hard, give their hard earned dollars: don't you wish to do your part?")
   b. Seek reassurance ("Your pledge will go a long way toward meeting our goal.")
   c. Need to be appreciated ("We really appreciate your support...")

4. Facts oriented (convincing a viewer to do something through the facts)

   a. Need for complete information ("Here's how your dollars work to keep us on the air...")
   b. Highly organized ("Here are the simple steps to make your pledge...")
   c. Need to be correct ("Supporting Channel X is the right thing to do because ...")

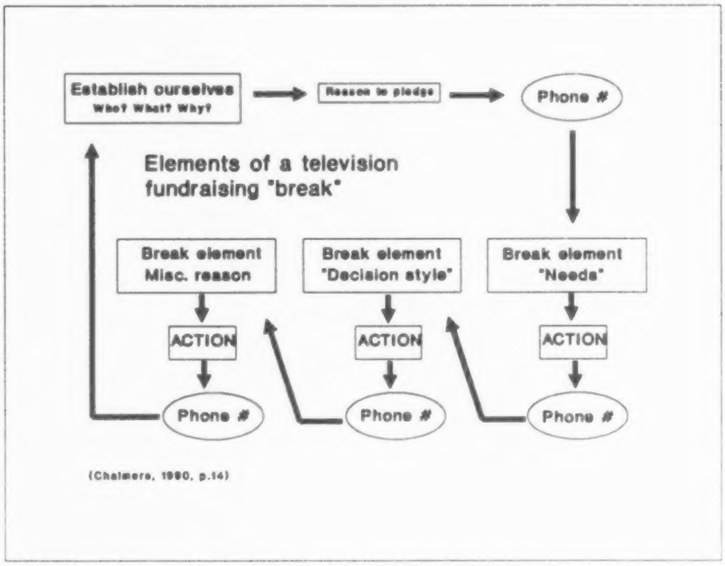
The anatomy of a fund drive

These elements, an individual's needs and decision making style, can be incorporated into an actual pledge drive. Whether it be health related, commercial, or public television, the basic anatomy of the activity remains the same. Figure 1 charts the flow of a typical pledge break, showing its reliance upon Maslow's model and an individual decision making style. The call for the viewer to go to the telephone (take action) appears before and after each element of the break.

Conclusions

It is evident that although the various fundraising presentations are similar in many instances, they each possess identifiable characteristics that make them unique. For example, health related telethons rely upon images of children in need and concerned adults doing all they can to help. The look is usually glamorous, and involves bright colors and excessive activity. "For profit" advertising involves well known spokespersons in conservative dress who express concern for the viewer's well being. Unlike health telethons and public television festivals, phone volunteers and other adults may not be involved. Public television fundraising involves local, state, and national celebrities who give of their time to persuade viewers to become a member of a larger "family", the community of public television. The look is usually designed around a colorful theme and involves energetic volunteers and personalities.

Clearly, the impact of television cannot be denied. Its ability to persuade, inform, educate, and motivate have caused it to become a extraordinary tool for compelling viewers to take action.


Establish ourselves
Who? What? Why?
Reason to pledge
Phone #
Elements of a television fundraising "break"
Break element Misc. reason
Break element "Decision style"
Break element "Needs"
ACTION
ACTION
ACTION
Phone #
Phone #
Phone #

(Chalmers, 1990, p.14)

Figure 1. Anatomy of a television fundraiser

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Ritual, Memory and Myth: Wedding Photography as Social Process

Charles Lewis

For several years of my life, I spent hours each Saturday first in a church and later a reception hall. I was a wedding photographer. With each new couple I wondered just what it was I was doing. Why did these well-dressed couples want me to jump into the middle of their sacred ceremony? Was I there just to mechanically document the event on film or was there more to it than that? This ethnographic study is one attempt to understand the relatively unexplored phenomenon of American wedding photography — as well as a period of my own life.

Using ethnography in the study of visual communication is a rather recent development in the scholarly community. Ethnography implies a different view of photography than has usually been the case. Two general misconceptions in particular have affected producers, consumers and scholars of photography since its origins more than 150 years ago. The first concerns how the photograph is often considered to be something which "tells neither truth nor falsehood, but ... tells it like it is."[1] It appears that the photograph can present to the viewer a direct 'snatch' of what the human could perceive with his or her own eyes. In this 'snatch of reality' sense as well as in the technological sense of the photographic process needing light, photography *is* a natural process. It is no wonder that in the early years of photography during the mid-ninteenth century the medium was considered "a discovery of nature's capacity to register its own images." One can understand why photographs were called "sun pictures," and instead of being "made," they were said to be "'obtained' or 'taken', like natural specimens found in the wild."[2]

Thus, because of this inescapable nature of the photographic process, it is not difficult to grasp why the strong belief in the factuality of the photograph persists — why people tend to confuse reality with representation when viewing photographs. But while this belief in the photograph "telling it like it is" may be understandable — it is also naive.

The second misconception concerns not only photography, but the study of visual communication in general. Photographs — and most visual communication products — are often considered to be the sole creations of an individual author. Studies of photography usually examine how the talent, experience and personality of an individual are communicated through his or her photographic images. Much of this scholarly concern with the individual author of photographs comes from art appreciation and the "model of conventional art history," according to American Studies historian Alan Trachtenberg.[3] He writes:

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[1] Sol Worth, *Studying Visual Communication* (University of Pennsylvania Press, 1981), p. 175.

[2] Ian Jeffrey, *Photography, A Concise History* (New York: Oxford University Press, 1981), p. 10.

> In general, histories have provided ... compilations of connoisseurship. There has been little notable effort to address the (photographic) medium itself, to examine its evolving character, its social and cultural properties, its complex relations with other media, and the great variety of roles it performs.[4]

These two misconceptions have limited the scholarship concerning photography. The medium involves much more than individuals producing snatches of reality in some sort of social and cultural vacuum. Photographic images are social constructions — they are negotiated interpretations of "reality" which are always grounded in particular social and cultural contexts. Photography is a social process, as are all communicative processes. The traditional "transmission" model of communication — where communication is defined as one "imparting, sending, transmitting or giving information to others" —does not answer questions of social process. Instead, a "ritual view" of communication needs to be used. In the ritual model, communication is not considered a one-to-one personal process, but a social process linked with such terms as "sharing, participation, fellowship, and the possession of a common faith."[5]

Despite these misconceptions, the study of visual communication as a social process is growing. Several scholars in the past two decades have conducted research in this area. In art history, works by scholars such as Janet Wolff, Michael Baxandall and John Berger have explored how art must be studied by not only focusing on connoisseurship, but by analyzing the organizational structures and cultural contexts in which art was produced. Janet Wolff writes in *The Social Production of Art* how every form of cultural production is a collective process "situated" within social structures at a given historical time.[6] Because of this, the individual author is as much of a mediator as a creator. The author mediates between his own creativity and the social, cultural and historical contexts in which he produces images.

Michael Baxandall's methods for understanding fifteenth-century painting are just as applicable today for one seeking to understand photography. Baxandall, in *Painting and Experience in Fifteenth-Century Italy*, looks at four levels of the production process in particular: (1) the contractual arrangements between master painter and patron (deadlines, types of paint to be used, payment, who would actually do the painting, etc.). (2) the function of paintings (provides status to patron; instructs viewers spiritually, etc.). (3) the visual constructions of paintings (specific codes employed and where codes originated). (4) how the paintings were received (how viewers interpreted style; what critiques meant, etc.). Therefore, without an understanding of the production process — the social context — behind a fifteenth-century painting, the modern viewer will arrive at a completely different interpretation of the work than was originally intended.

John Berger, in his book and BBC television series *Ways of Seeing*, describes in critical detail how what people see in art and other visual communication is very much affected by "what we know or what we believe."[7] Howard Becker advocates a similar approach as a tool for sociological investigation of contemporary art. Becker shifts the investigation from the individual "genius" author and his images to the collective processes of production — the "large network of cooperating people, all of whose work is essential to the final outcome."[8]

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[3] Alan Trachtenberg, ed., *Classic Essays on Photography*, (New Haven, Conn.: Leete's Island Books, 1980), p. vii.

[4] Ibid., p. vii.

[5] James W. Carey, "A Cultural Approach to Communication," *Communication* 2 (1975): 3.

[6] Janet Wolff, *The Social Production of Art*, (New York: New York University Press, 1984), pp. 22-25.

[7] John Berger, *Ways of Seeing*, (New York: Penguin Books, 1983), p. 8.

Barbara Rosenblum, Richard Christopherson, and Dona Schwartz use approaches similar to Becker's in studies of photography. Rosenblum, in her comparative ethnography of news, advertising and fine art photography, in a sense fine-tunes Becker's approach by analyzing how the social conventions that help shape the production process originate in social structures and organization. Christopherson studies fine art photographers as an "occupational group."[9] Schwartz presents an ethnographic comparison of the "specific symbol-sharing communities" of fine art photographers and amateur camera club photographers.[10]

Other studies have focused on the "home mode" of visual media — the private construction and use of images. Sol Worth in his appendix to *Studying Visual Communication* outlines a method he calls "ethnographic semiotics" — rather than the researcher reading the visual text, the researcher studies the "ordinary" person as a text producer and reader.[11] Richard Chalfen, in a different proposal, advocates studying people's home movies as "cultural documents." Chalfen suggests that studying home movies is an unobtrusive way to find cultural patterns of meaning — shared values, beliefs and behaviors.[12] Christopher Musello studies the "functions of family photography" through analysis of family snapshots and photo albums — how photography "occurs in every-day life."[13]

Concerning the ethnographic study of wedding photography, Erving Goffman's semiological analysis in *Gender Advertisments* is of particular interest. For Goffman, nonverbal (visual) communication plays an important role in rituals, which can be anything from a graduation exercise or elaborate wedding to an interpersonal greeting or farewell. Education, religion, politics and even interpersonal relationships — all involve ritual. Such rituals typically involves some sort of "social situation"; thus all behaviors in such a setting have significant meaning. All behaviors are "displays" which inform others about one's "social identity, mood, intent," etc. Thus, the social situations of ceremonies are "arenas for mutual monitoring." In short, rituals are combinations of the real and the ideal — they utilize real behaviors in order to support a consensus of idealized, negotiated meanings about the social structure.[14]

Often, objects — "relics" such as "souvenirs, mementos, (and) gifts" — are used to help keep the displays of meaning in rituals fresh in people's memories. Photographs are among such relics, but they mean more than other relics because of their representational quality — they are a combination of "ritual and relic." They are two-dimensional, static renditions of human behavior — "freeze-dried" moments of actual transitory ritual which are "fixed into permanent accessibility." Thus, photographs can further concentrate the "social arrangements and ultimate beliefs" displayed in transitory rituals. Photographs themselves are powerful (and portable) condensed representations of the real and the ideal. In this sense they are "hyper-ritualizations" — displays of meaning abstracted from their original contexts[15]

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[8] Howard S. Becker, "Art as Collective Action," *American Sociological Review* 39 (1974): 769.

[9] Richard Christopherson, "Making Art with Machines: Photography's Institutional Inadequacies," *Urban Life and Culture* 3 (1974): 3.

[10] Dona Schwartz, "Doing the Ethnography of Visual Communication: The Rhetoric of Fine Art Photography," *Research in Language and Social Interaction* 21 (1987): 229.

[11] Worth, *Studying Visual Communication*,appendix pp. 200-202.

[12] Richard Chalfen, "Cinema Naivete: A Study of Home Moviemaking as Visual Communication," *Studies in the Anthropology of Visual Communication* 2 (1975):126-130.

[13] Christopher Musello, "Family Photography," in Jon Wagner, ed., *Images of Information* (Beverly Hills: Sage Publications, 1979), pp. 102-103.

[14] Erving Goffman, *Gender Advertisments* (Harper and Row, 1979), pp. 1-9.

Theory, Methods and Research Subjects

All of the above-mentioned scholarly work stresses that photography is a social process. Photographs are much more than "psychological, aesthetic or technical products" — they are products of "social and cultural dynamics."[16] I subscribe to this developing theoretical framework of photography as social process. In following Glaser and Strauss' strategies for generating theory in qualitative research,[17] I formulated the following theoretical questions from my data, in conjunction with Goffman's ideas in *Gender Advertisments*:

1. How does the practice of professional wedding photography link with the actual wedding ceremony?
2. How do conventionalized photographic image constructions correspond to the actual wedding ceremonial displays and rituals?
3. What is the significance of these linkages or lack or them?

During a six-month period in the fall of 1989 and spring of 1990, I spent approximately 70 hours observing a professional portrait/wedding photographer go about his business during different time periods and on different days of the week. I observed him "consulting" with couples who were planning a wedding and interested in his services; I observed him discussing final wedding picture and album orders with couples; and I observed him photograph several weddings. In addition, I observed him in a number of other situations, such as photographing families in the studio or attending meetings of a local professional photographers' organization. In addition, during this period I interviewed the photographer I observed as well as other professional wedding/portrait photographers. I also drew on my own experience as a professional portrait/wedding photographer when formulating and executing data-gethering and analytic techniques.

Bill,[18] the photographer I observed as well as interviewed, is 32 years old and has operated his own "full-service" portrait studio in one of the newer suburbs of the Minneapolis/St. Paul area for more than two and a half years. At present, the majority of his business is in wedding coverage. Several years ago, Bill completed a six-month comprehensive training course in commercial photography and since then has attended seminars sponsored by the Professional Photographers of America, Inc. (PPA), a sort of national guild of portrait photographers.

Bill is a member of the national and state PPA organizations and is on the board of the local Twin Cities chapter. He worked for several other photographers before opening his own studio. Bill has one part-time employee who performs office-related tasks, but he is the sole photographer. Because of this, he claims to have had to "turn down 100 weddings last year." Bill, who is married and has a young daughter, appears to be quite ambitious and energetic. He works long hours to make sure his studio is successful.

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[15] Ibid., p. 10- 20.

[16] Musello, "Family Photography," pp. 101, 118.

[17] Barney Glaser and Anselm Strauss, *The Discovery of Grounded Theory: Strategies for Qualitiative Research*(New York: Aldine Publishing Co., 1967).

[18] The name "Bill" is a pseudonym.

In addition to the work with my key informant, I conducted interviews with 15 other professional portrait/wedding photographers in the Twin Cities seven-county metro area.[19] Each interview averaged two and one half hours and was conducted at the photographer's place of business.[20] Of the 16 professional photographers interviewed (including my key informant), twelve work full time in the business of professional photography and four work part-time in photography and part or full time elsewhere. While ages range from 29 to 66, the average age of those interviewed is 43. Only two of the 16 are female. Eight work out of "storefront" studios in a business location, and eight work out of residences. All but two of those interviewed are affiliated with one or more of the PPA organizations.

While the percentage of each photographer's business devoted to wedding photography range from 30 percent to 100 percent, the average is 66 percent. Wedding order dollar-figures range from $600 to $2,000, with the average being $1,180.[21] Thirteen own their photographic business; three are employees. Of those who own their own businesses, four employ nine or more part-time wedding photographers; others employ fewer or work alone. While some of those interviewed photograph as many as 75 weddings annually, others photograph far fewer. Two no longer photograph any — instead, they manage and train other professionals working for them. In 1989 those interviewed photographed a total of 518 weddings, and their studios accounted for an approximate total of 1,800 wedding coverages in the metro area.

Discussion and Analysis

The American wedding ceremony as traditional ritual is a social rite of passage often enveloped in personal, familial relations and religious belief. In addition to personal significance, the traditional wedding ceremony adds a special *social significance* to the behaviors of those involved in the particular social situation of marriage. This perhaps explains why people follow traditions they really do not understand well. Why the white dress? Why the cake? Why a church service for a couple who are professed agnostics?

According to Bill, "People don't even know what the customs of the wedding are. They don't know why they buy a wedding dress — they don't know the history of the customs." This is true, and it does not matter. It is likely that people add these ritualized elements to the wedding event not necessarily because the rituals have deep personal significance, but because they have an accepted social significance. They are ritualized displays which all recognize — they are conventionalized messages that attest to the significance of the occasion not only to those participating, but to those who 'witness' the displays as well. The same is true of the photographs.

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[19] I define the term "professional" as the photographers I interviewed do. A professional may be a full- or part-time photographer of weddings, but he or she is no "hack." The professional photographer has high-quality equipment, which in the Midwest means at the least a medium-format camera such as a Hasselblad or Mamiya RB 67, camera filters, a sturdy tripod,and a lighting system, which could range from a quality on-camera flash unit to a portable studio including a power pack, lights on stands and diffusion equipment such as umbrellas. The professional also has some form of training or education, whether it be vocational or college schooling; attending seminars conducted by organizations like the PPA; or serving as the apprentice of a professional.

[20] Those interviewed were not chosen randomly, but strategically. Recommendations from other photographers, advertising and membership lists of professional organizations all contributed to decisions over which photographers to interview.

[21] According to *Modern Bride*'s "Bridal Registration Study" of 1988, the average wedding in the United States now costs $10,000. Thus, it can be assumed photography is one of the major costs associated with weddings. This information was supplied during a March 21 phone conversation with Dayton's manager of Gift Registry in Minneapolis.

Wedding photographs, for the most part, are highly conventionalized, but this does not detract from their significance — it adds to their significance because it affirms the particular social situation of the wedding. During the formal picture-taking session, people being posed often joke about being a "mannequin" or a "Barbie Doll." Bill even jokingly refers to his subjects as "bodies" sometimes. For example, when he is setting up a new group picture he might say, "We need some new bodies here!" But people accept and even enjoy this obvious "conventionalizing" of their presentations of self. They do not express horror or disgust at being depersonalized. Portrait photographers recognize this, of course, and most make sure their creative juices, so to speak, stay within the bounds of the codes of portrait photography. Being unconventional, as a fine art photographer might do in order to be "creative," could hurt. According to one photographer:

> We read from left to right — we like to see things happen in that way. I only know of one photographer who is what you might call creative. Other portrait photographers look at his stuff and say, 'Wow, I never thought of it that way!' But the guy has been broke four times and can't sell his product.

Thus, while some photographers may emphasize candids and "being fun" and others may emphasize "being a friend" and "capturing romance," most wedding coverages are quite similar — they include similar poses; similar lighting; and similar "captured" events and feelings in similar narrative order in similar leatherette album books. The photography is not really a highly personalized documentary as the album inscribed with "Our Wedding" might imply. But most people don't want a highly personalized documentary — they want a "hyper-ritualization," as Goffman would say.

Photographs, because they are permanent representations which can influence one's memory of the ceremony, tend to increase the signification of the wedding event. However, the process of photography also alters the signification of the event. It imposes itself on the actual ceremonial event, and its conventionalized images may tend to mystify memories of the actual rituals of the ceremony. In other words, the photographs do not necessarily represent the actual rituals and emotions which were involved, but how the rituals and emotions *should have been*, according to the wedding myth in our culture.

As one photographer said, "Part of it's the dream, you know? ... I mean, since (a bride) was a little girl she's thought of that wedding day as a point of focus ..." Other photographers label this phenomenon the "fantasy," or the "Cinderella story" or the "illusion." However one phrases it, it is apparent that the photographer in collaboration with his or her subjects imposes the photographic process on the actual ceremony in order to create through pictures a sometimes artificial and always idealized account of the actual ceremony and those involved.

Yet, at the same time, the photography is actually a *part* of the ceremony — the process of taking pictures is itself a ritual, and the resulting wedding album photographs, as representations of ritual, are part ritual and part relic. Thus, the practice of photography at the wedding is itself ritualized display — if anything, it signifies the couple getting married thinks enough of the event (or has enough money) to have a professional photograph it.

The resulting wedding album is another level of ritualized display — one finds between the leatherette covers a potent, condensed version of the *significations* of the event. The album is much more than a personal record — it is a narrative photographic construction of significant social meanings. Some of the images are predominately *denotative* in nature and thus more documentary; some are predominately *connotative* in nature and thus are more mythical. All the wedding images, however, are conventional displays which thus have agreed-upon social significance.[22]

In any case, one must always keep in mind that wedding photography is at base a business. The photographers make the most of the somewhat illogical nature of ritualized display in the wedding ceremony. While most claim to believe that what they provide couples with is valuable or even "priceless," they usually qualify such statements by commenting on how "weird" or "odd" the process of American weddings and professional photography of weddings are. For example, one photographer, soon after telling me how "important" wedding pictures are for couples, said weddings are "a waste of money" and were "just commercial foolishness." He then said, "But if they want to spend $600 or $700 on pictures, that's fine with me." Or as Bill once told me while we were returning from a wedding coverage, "When you sit down and think about it, weddings are really strange. The average wedding costs about $15,000 to $25,000 today. That's absurd! It's retarded!" But, of course, it's "good business."

The following analysis will be divided into three parts — each being an elaboration of material presented in the previous paragraphs. The first will deal with wedding photography as a ritualized part of the ceremony; the second will deal with the denotative documentary nature of wedding photographs; the third will deal with the connotative mythical nature of wedding photographs. It is through these three levels of meanings that we can better understand how wedding photography is a social process.

Wedding Photography as Ritual

Being a wedding photographer is not an easy job — Bill says one must always be "part technician and part public relations person." The wedding photographer is involved in what people generally consider a necessary but potentially unpleasant process. The photography is usually considered to be an imposition by at least some of those participating in wedding ceremonies. The problem is that the photographer is "entering their private world," according to Bill. Complicating this further is the fact that the wedding couple's "private world" is on the wedding day populated by a whirlwind of friends and family members who may not normally see one another.

In short, the wedding photographer usually steps into a reunion of significant others. Although it is a "happy" or "special" day and the photographer may be extremely entertaining, thoughtful and friendly, most people in wedding parties don't particularly care to have this stranger with the big camera, tripod and lights take up two or three hours of their time before the wedding ceremony and then follow them around some more during their reception, blinding them with bursts from an electronic flash unit. It may get old quickly. And not only is the photography a sort of imposition, it also usually adds an element of hysteria to the wedding. Bill calls it "panic city." Usually there is little time to take many pictures of many people and events. This often translates into rather frantic maneuvering of people, objects and photographic equipment.

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[22] Roland Barthes, *Mythologies* (New York: Wang and Hill, 1987), pp. 109-159.

During every wedding I attended with Bill, I overheard comments between families or wedding party members attesting to this negative perception of having to be photographed. For example, I heard two different brides at different weddings say the same sentence to Bill: "I just want to get this over with!" Often people who would be enlisted by Bill to pose with others in a series of pictures would exclaim "Good!" or "Thank God!" when Bill would tell them he was finished photographing them. Now, I do not mean to imply that Bill was callous with people or negative in his interactions in any way. These negative comments were all related to the *general idea* of being photographed at the wedding, not Bill's particular social skills, which are impressive.

Compliments also often attest to how people find or at least expect the photography to be distasteful or an imposition. Of course, during the wedding and before the "proofs" have been processed and distributed to newlyweds, it is impossible for people to complement a photographer on the actual images he has "taken." Still, some make such comments. For example, one photographer told how a bride called him a week after the wedding and told him how much "fun and relaxing" he was and how "so many people said they really liked the pictures." He then asked her when these people had seen the pictures. She said "they haven't yet."

Such statements attest to the importance of a wedding photographer's ability to interact well with people at weddings in order to battle the negative perceptions people sometimes have of wedding photography. According to one photographer who averages $2,000 a wedding, many people say 'I hate to have my picture taken' to him because they have had a "bad experience" with a wedding photographer. He said they are pleasantly surprised when they find that with him "they've indeed enjoyed the process of being photographed." Many of the photographers commented on how couples will like their photographs if they liked the photographer, even if the photographs were less than technically perfect. For example:

> There's a dear man who I had do some weddings a year ago. He had tremendous wit — very funny. But he did a lot of poor pictures. The lighting wasn't right. On occasions his flash didn't go off. We got the proofs back from his first wedding with us and said, 'Oh my God! This is it!' But they liked him so much we got hundreds of dollars of reorders. We would get calls saying they want to book us, but they want him to do the pictures. And they were atrocious pictures. That was the only wedding he really did badly for us. But if it wouldn't have been for his personality, I think we would have been eating that order.

Conversely, if there is some sort of personality clash between the photographer and bride or groom, the chances are the couple will not be pleased with their photographs, no matter how technically perfect they may be. Many of those interviewed commented on this. For example, one successful owner whose studio covered 350 weddings last year said:

> A wonderful photographer — a technocratic behemoth — out there producing beautiful work but insulting people will not have his work received as well as a set of mediocre proofs from a photographer everybody loved. No doubt about that. I've seen it a hundred times.

A 'good' photographer becomes more than a picture maker; he or she becomes an expert who can help people keep a lid on stress by helping manage the affairs of the wedding day through fun, friendship and expertise. Thus, photographers become central to the wedding ceremony and influence it in important ways.

For example, all of the photographers interviewed said they do their best during consultations to "talk (couples) out of" the tradition of not seeing one another before the wedding. All of those interviewed said that doing the bulk of the formal photography — the photographs of wedding party and family groupings — before the wedding makes for a much easier and less stressful time for the photographer as well as those in the wedding party. Thus, conversations such as the following are not uncommon during consultations:

> I ask them, 'Why don't you want to see each other beforehand? Because you don't know who each other will be? Face it, this dates back to an arranged marriage.' I go on to tell them, 'You've obviously picked each other out. Now all it's gonna do is get in the way of taking good wedding photographs, and I would hate to spoil your wedding day for the sake of an hour or two beforehand when you don't want to see one another.' And I'll even play on the fact that the photographs will last a lot longer than that memory. ...

Thus, the photographic ritual usually supercedes the long-standing tradition of bride and groom not seeing one another before the service. The photography changes the traditions and experiences of those involved. Another example of this phenomenon can be seen in how photographers focus on providing services other than photographs. Because of the photographer, certain problems in timing, materials or people may well be avoided. As one photographer said, "I feel we have a certain obligation to the bride and groom to keep the day on schedule." Keeping the day on schedule is often related to certain kinds of photographs. The photographer must keep the photographs of the "formals" before the wedding on schedule so the actual ceremony is not disrupted.

But other "scheduling" becomes quite important as well, such as the speed and rhythm in which bridesmaids walk down the aisle; when and how the cake cutting and feeding takes place; when the couple eats at the reception; and when and how the bouquet is tossed or the garter thrown. All of these rituals tend to be regulated by the photographer — he or she is a sort of pacemaker of many elements of the wedding throughout the day. This "service" is taken on by the photographer in order to "capture" elements of the wedding in the most visually pleasing way possible — one has to be in the right spot at the right time with the right equipment and so forth. But because of this, the day is kept "on schedule," an effect which goes beyond photography.

Other services many photographers provide include small but significant practices such as pinning the flowers on groomsmen and others. According to one photographer:

> What good does it do to have them pin their own flowers on? They will never get it done right. So I just pin all the flowers on. It doesn't take me long to do it, and then I know it gets done when I want it to get done. And they see it as a service. I look at it as avoiding an annoyance.

Despite providing such services, the wedding photographer continually walks a very fine line in what is normally a rather frenzied situation. He or she must be an "orchestrator" of people and events and somewhat "unobtrusive" — all at the same time. The photographer must be very careful not to "get too bossy." Yet, he or she must also "get to the point" and "take command" or few photographs be taken. One way to cope with this is to try to make the picture session "fun and relaxing," as Bill says. To accomplish this photographers may act "really bubbly" or "play the bumbling one everyone laughs at." Some photographers might "just be a friendly person" or "up in a positive way that has a kind of 'oil on the water' effect." Others have developed rapport that is "kind of like a doctor's bedside manner" — they tend to be "low key" and "considerate."

However one phrases it, it is apparent that *acting* and *interacting* are important parts of successful wedding photography. Most of the photographers interviewed stressed the importance of "performing" and "relating" at weddings. If handled right, the photography can *enhance* the actual wedding experience because the photographer creates opportunities for behaviors which engage real emotions. For example, during the consulting phase, one photographer describes to a couple what some of the events during their wedding might look like and what they may mean:

> ... And then I romance it somewhat. ... I say to the bride, 'It's an hour before the service, and you are in the dressing room. And your daddy comes in and walks up to you, and you pin his boutonniere on his lapel. He looks down into your eyes and there is a moment of time when you are his little girl and he is giving you the last bit of advice he will ever give you. And then your mother walks over and cuddles up in his arms, and they are both looking at you —you're in profile — and they are thinking of you and your future.'

If the couple appears to be enthralled by this description, the photographer will make a note saying 'mother and father looking at bride.' Then during the wedding, he will follow his notes taken at this consultation and actually arrange these types of situations so he can photograph them. Bill does this too. For example, at each wedding I attended with him, I heard him coach the bride on what to do right before she and her father walked down the aisle at the beginning of the ceremony. He told each bride to "stop in the church doorway ... lean over and whisper in his ear, 'I love you,' and kiss him on the cheek." The father is not aware of the arranged nature of the moment and reacts accordingly. Bill, of course, snaps the shutter and 'captures' a special emotional moment.

Thus, wedding photographers *create* spontaneous emotional moments in the weddings they photograph. They all insist the emotions are there anyway — the emotions are always "subject-generated" when it comes right down to it. The photographers claim to just find ways to make the emotions visible, whether they are "mining" emotion, "evoking feelings" or "nudging responses."

Wedding Photography as Documentary

According to this analysis, the actual images constructed by a wedding photographer fall into two categories — predominately denotative or predominately connotative. However, it must be stressed that these are never mutually exclusive categories; there is always a mixture of denotation and connotation in each photograph. Predominately denotative images, however, are meant to convey to the viewer actual elements of the wedding ceremony, rather than mythical elements of the ceremony. These images serve as *keys to memories* of the people, events and material objects of the wedding. Thus, they are documentary in nature.

Nearly all those interviewed stress the importance of the denotative level of wedding photographs. One photographer, for example, calls wedding photography "memory insurance." Another claims he is "recording a time in people's lives." And, of course, in one sense they are right. The denotative level is at the base of every photograph. Whether the picture is conventionalized myth or not, it still includes a representation of "real" people during a "real" moment of time. But myth goes beyond the "realness" of the event, as I shall discuss in the next section. Contrived connotation adds a different element to the photograph as "ritual and relic," as Goffman would say. Most of the photographers, however, emphasize the documentary nature of what they do, even though many of the images they produce convey much more than the denotative level. The following comments is typical of those interviewed:

> ... I think if a bride sat down and analyzed 'why am I doing pictures?', at first she might not even know. And then she'd remember that her gown is beautiful and she wants to remember that. And then she wants to remember her family as they were then — at that time in her life. I think it's all people-oriented; what my husband loooked like; what my best friend looked like; what they wore; and all that sort of stuff. ... I don't think that they ever stop and think that ... 'this is a heritage my grandkids are going to look at' ... but I think that is what it is all about.

As stated earlier, the predominately denotative images convey information about three elements of the wedding — people, events and material objects. The photographs of people are more than just images of those special to the couple. These people pictures detail a hierarchy of relationships. In this sense the pictures document a central aspect of wedding ceremonies — the display of kinship. In the ceremony and its rituals, the kinship hierarchy is displayed through such arrangements as who is in the wedding party; the order members of the wedding party are organized into; who does the reading; who is the reception host; who are the cake cutters; and so on. The photographic process adds to the ceremony's kinship displays by first separating the relationships out further and then making them timeless, "freeze-dried" relics which key memories of the actual displays.

What is meant by photography separating relationships out further is how the photographer first isolates a particular kinship group and then photographs it. The bride and groom, of course, are usually a part of each one of these pictures, since most relationships center on them. For example, a photographer does not simply photograph an entire wedding party or family — he separates out particular groups. Usually the photographer will photograph the entire wedding party; the wedding party without ushers; just the bridesmaids; just the groomsmen; just the bride and groom with best man and maid of honor; just the bride and maid of honor; just the groom and best man; and, of course, the most important relationship of all — just the bride and groom. Thus the photographer details a hierarchy or relationships. The same process happens with families. Usually the photographer will first photograph an entire family — including grandparents, aunts, uncles, children of brothers and sisters, etc. Next he will photograph the immediate family; then the bride and groom with their parents; and so on.

Other than people, certain actual events or rituals of the ceremony are nearly always photographed. These include the wedding party walking down the aisle at the beginning of the service; the couple meeting at the alter; the giving of vows; the lighting of the unity candle; the wedding party walking up the aisle after the ceremony; the receiving line; leaving the church; kissing on demand at the reception; and perhaps toasting at the reception. Most of these pictures are taken with less concern for form. The photographer usually uses the harsh and rather flat light of an electronic flash unit. He does not concern himself much with how light falls on the subjects, perfection of pose, and so on. In short, these pictures are usually the only true "candid" — informal and unposed — photographs of the entire wedding.

Certain material objects must also be "captured" on film if the photographer is to have a successful wedding coverage. Of particular importance is the bride's dress — it is by far the central ritualized object of most weddings. When photographers photograph the bride alone, what they are really emphasizing is not the bride herself, but the dress the bride is in. People are often very concerned about "how the dress looks." For example, during every wedding I attended with Bill and often in my own experiences, the same scene would take place: The photographer is taking photographs of the bride alone, but is framing the image so that only the upper half of the bride's body will be in the picture. This means the photographer is not concerned with how the bottom of her dress looks — and it is usually bunched up, not spread out and flowing, as in full-length pictures of the bride. Invariably someone — usually the personal attendent or the mother of the bride — will rush in and start to arrange the bottom of the dress. The photographer must then stop what he or she is doing and assure this person that the bottom of the dress "will not be in the picture."

Other ritualized objects which are usually photographed include the couple's rings, the cake, the bridal bouquets, and the head table at the reception. All of these objects are themselves symbols of certain rituals in the wedding ceremony or the ceremony itself — they are relics endowed with special meaning. Thus, the photographs of these things are objects which represent other objects or events which represent special meanings. After the actual wedding dress ends up in the closet and the cake in people's bellies, the photographs of these ritualized objects keep their meanings fresh in people's minds.

Wedding Photography as Myth

The predominately connotative photographs usually convey a romantic and deeply emotional and significant story which in some ways never existed. These sort of images depict "what happened in front of the camera, not what really happened," according to Bill. The predominately connotative images usually fall into two categories — based on two separate settings. The first setting is in what could be called 'the land of romance.' In these pictures, the bride and groom hold hands; they gaze into each others eyes; they walk off into the future; or they may stand alone, gazing at their ring or bouquet, seemingly pondering the significance of the ceremony.

In the 'land of romance,' people are often bathed in soft light and surrounded by the dream-like haze of a soft-focus filter. It is this type of picture that Bill considers to be among his most creative. The second setting is more grounded in the actual ceremony, but the pictures depict ceremonial rituals which would probably *not have taken place* except in front of the camera. Images of this type include cutting the cake and feeding it to your spouse; the groomsmen pushing the reluctant groom into the church right before the ceremony; the groomsmen or bridesmaids looking at the bride's garter; and so on.

For example, in my own experience and at each of the weddings I observed Bill photograph, the cake-cutting ritual was not really part of the actual ceremony. When the couple cut the cake and fed pieces of it to one another, few in the reception hall took notice. It was usually arranged quickly at the reception and conducted solely for the sake of the still photography and video. It was something to get out of the way, so the cake servers could start cutting up the cake for the meal. It was a completely "staged" event.

Another example is when I observed Bill arrange five bridesmaids around the bride so he could photograph them all looking at the bride's garter. Because of where he positioned the women, some of them could not even see the garter on the bride's thigh. But this did not matter. He told them, "Even though you may or may not be able to see the garter, look right down there — do it anyway. It will look good in the picture." Thus, the actual event had no significance other than serving as a scene to be captured on film. Many of the photographers label these types of images as "gimmicks." Yet, the images do serve a purpose — they fill out the narrative within the pages of the wedding album.

These "mythical" pictures, to use Barthes' term, express an idealized and highly conventionalized fairy tale — or a "movie." Many of the photographers equate the role of the wedding photographer to that of a "director" and the wedding party members to "stars" or "players." According to one photographer:

> ... I suppose when you do it right — if you orchestrate it appropriately — then it's kind of like a movie. And people get into movies, you know. Even if they know the plot and they know the ending and they know people are actors, they get into it. And I think in a sense (wedding couples) want to be those actors because they want the happy ending the movie has.

Thus, wedding party members may be stars in their own "movie" or "play," but it is the photographer who creates much of the mood and impact. Conversations among those in the wedding party during weddings often reflect this "star" quality. For example, people at weddings often express a sort of amazement at how detailed the construction of a photograph can be. A person is instructed to place a foot in a certain position; bend the knees a certain way; smile "big" or "a little" or not at all; tilt and turn the head in various ways; look at a certain spot; drop or lift a shoulder; hold the bouquet, ring, garter, glass, hand, etc. a certain way; place an article of clothing in a certain way; and so on. In these situations, the subjects of photographs are often equated with public figures — particularly glamorous models or movie stars.

For example, at one wedding the groom's mother began calling the groom "Mr. Hollywood" during the picture-taking session. Another groomsman said the groom was "suave and debonair." At another wedding the best man commented on his pose with the groom as being "just like G Q!" Thus, during the photography, people apparently attain a sort of celebrity status for a short period of time. This status is encouraged by the photographic ritual and subsequently "captured" by the photography as well. The "celebrity-ness" of those in the wedding party is "freeze-dried" into every photograph. Thus, it too becomes part of the myth.

The wedding "story" is composed of an album of photographs — two-dimensional images which people often mistake for "snatches of reality." This empowers the photographic wedding story with a sense of "reality." In short, the denotative level of the pictures makes the connotative level appear to be factual. Couples are able to open their wedding album and say, 'Yes, we *lived* the fairy tale.' But this all must be very subtle or the myth will not appear to be real. According to Bill:

> People as a whole don't like to look posed. But with any photograph you have to pose them to some degree to get what you are looking for. ... I don't know how many wedding couples have come in and said, 'I don't want a posed look.' Well, what does this mean? It means most of them are just saying they want to look natural —they want it to look like the photographer wasn't even there.

Thus, the narrative picture story is partially based on the actual and partially based on conventional fantasy. Since the pictures aid one's memories of the ceremonial event, it is fair to say that one's memories are partially based not on what happened, but on conventionalized myth. Thus, it appears that some wedding memories are *constructed* through wedding photographs.

According to the photographers, what the viewers of wedding photographs "imagine" is a sort of deeper reality of the wedding — a sort of romantic essence. The wedding photographer simply presents, through manipulations of camera, filters, lighting and poses, the romance *behind* the ceremony, at least in pictures taken in the 'land of romance.' Bill says, "We tighten on their emotions ... we do things that are closer to what they would be doing if no one else were around." However, these emotional images which photographers construct are more than simply contrived — they are conventional. There is a difference between the two terms. Thus, the photographer may or may not be photographing couples doing "what they would be doing if no one else were around." The photographer is always, however, constructing images which are conventional — it is relatively the *same* romantic fairy tale for each couple. And it is usually presented in the same narrative form in each wedding album. So the plot and the scenes of the "movie" don't change — just the actors.

Thus, the mythical photographs, whether they present the emotional "bones" of the particular ceremony or not, are always presenting the social "bones" of the American wedding ceremony. Conventional imagery is important because it is a display with an agreed-upon meaning. As one photographer says, "I think some of the things we do are a little gimmicky. But people like it, you know, and they sell." Bill apparently agrees with this. As we were leaving one wedding reception, he told me that the couple "didn't want anything to do with the cake-eating shot — they said it's stupid!" This, however, is the exception — most couples apparently want this photograph taken. Bill then went on to say, "Personally, that's the way it should be — I think it's stupid too, but most people want it taken ..."

Thus, the cultural ideal — the conventional myth — is given a touch of reality not only through ritual and ceremony, but through photography as well. And even in photographs which are not predominately connotative, the ideal of "looking your conventional best" reaches deep. For example, there is a great deal of somewhat subtle construction in the series of kinship group photographs — in these the posed appears candid; the constructed looks natural. As Bill often tells the people he is posing, "It feels weird, but it looks good." In other words, he is saying 'what is actually happening here is not what you will see in the picture.' The actual doesn't matter, because perfection is being constructed.

Conclusion

The medium of photography has worked its way into the wedding ceremony in several ways and thus has affected what the wedding ceremony means to those Americans who enlist the services of the professional photographer. Photographers not only impact the course of actual events during the day of the wedding, they influence the emotional experiences people have at weddings, from a bride's relationship with her father to how a groom feels like a movie star on his wedding day. No photograph can be constructed in a social vacuum. Wedding photographs, as part of the display-oriented rituals of the wedding ceremony, particularly involve the social process of interaction between picture maker, subject and circumstance. Wedding photography is not about producing photographs as much as it is about producing or influencing the wedding experience.

Although I am finding the results of this research intriguing, I know I have excluded much more about wedding photography than I have included. There are many rich avenues of analysis which I have not yet explored. For example, interviews with couples who have gone through the experience of professional wedding photography could be insightful. Why do people think they needed a professional photographer? What did they think of the actual photographing? What do they do with their wedding album? Also, a more detailed analysis needs to be made of the construction of actual photographs and album narratives. In addition, the development of the codes and conventions of wedding photography need to be tracked. When and how did the narrative story originate? When and how did the emphasis on the mythic in wedding photographs originate? An analysis of the organizational structures of wedding photography could also be beneficial. How are these codes and conventions perpetuated within the profession? Ethnographic research of the profession's organizational groups, such as chapters of the Professional Photographers of America, could help here. Research into the professional schools would also be beneficial.

Deconstructing Images: Understanding The Role of Images in the Social Production of Meaning

Colleen McNally
Arnold S. Wolfe

This paper is about interpreting visual images. Its context is visual education. We approach the problem of interpreting visual images from two disciplines--fine arts and communication. Although our backgrounds differ we employ similar methods in teaching this aspect of visual literacy, whether the image to be interpreted is an advertisement or a painting. We both teach our students about formal elements of images--such as color, value, and line--and compositional principles such as size, placement, and space. But beyond this we also ask: "Are such elements and principles as they appear in the world of images used to communicate ideology?"

We define ideology as a culturally-shared belief system that claims to represent reality accurately. Alice Jardine, a Harvard professor of languages and literatures, elaborates: "Ideology makes culture seem natural . . . " (85). Ideology, then, refers to those ideas or forces in a culture that work to create or maintain the notion that what is or was made by humans--and is therefore cultural and changeable--is natural and consequently inevitable. Ideology, according to media analyst A. A. Berger, expresses the interest of a ruling class, race, or gender and serves to justify the status of the ruling group. And because ideology works to "naturalize" what is man- and woman-made, it works to "make . . . it difficult for . . . ordinary people to recognize that they are being exploited and victimized" (50-51). Analyses that seek to unmask the ideological meanings of visual communication are called deconstructions (see Jameson 1980, 291). We believe that such analyses are necessary in order to grasp the full cultural and political meaning of many visual messages. Doing a deconstruction, according to art historian Griselda Pollock, "entails a dual approach. First, the [analysis] must . . . locate [the particular practice of visual communication] in the . . . struggle . . . between classes, races, [or] genders[. Then the analysis must describe] what [the] practice is doing, what meaning is being produced, and how [it is produced,] and for whom" (Vision, 7).

John Berger's Ways of Seeing may have done more to advance this approach to visual analysis than any other previous work. This paper represents an extension of the portion of this pioneering book that examines how women have been seen in painting. We will analyze paintings, but our perspective extends beyond the world of fine art; John Berger insists that the conventions by which women have been seen in painting are echoed in such contemporary forms of visual communication as advertising and television (Berger 7, 135). Advertising, he notes, "relies . . . on the language of [European] oil painting. It speaks in the same voice about the same things" (Berger 135).

What is that voice, and what are those things? For our purposes, the most important "thing" European painting had to say about women was that they were objects, and, to extend Berger's metaphor, the way paintings "vocalized" women was ideologically patriarchal (Betterton 251). In brief, paintings of women in this tradition were made by men for the pleasure of men (Berger 47-57, 63-64; cf. Armstrong 230 and passim). Pollock

Suzanne Valadon. Reclining Nude (1928). The Metropolitan Museum of Art (New York), Robert Lehman Collection, 1975. (1975.1.214)

reminds us that "in art, as elsewhere, attempts [are made] to [reinforce] dominant ideologies about women and the order of the sexes" ("Women, Art and Ideology," 214). In the next section we will show how images produced by a male- and a female artist during approximately the same historical period point up the patriarchal nature of the conventional ways women were depicted and point to alternative ways of visualizing them.

Nudes by Valadon and Degas: Comparison and Contrast

Suzanne Valadon and Edgar Degas painted female nudes during the late 19th- and early 20th centuries. Study of painted nudes promotes visual literacy not only because it illustrates compositional principles and enhances understanding of the ideological meaning of images. Study of nudes is also justified from a visual literacy perspective, because, as art historian Rosemary Betterton notes, "The nude in art has been enshrined as an icon of culture since the Renaissance" (251). In the context of the compositional, ideological, and historical perspectives visual literacy incorporates, analyses that enhance understanding of the nude enhance understanding of the visual culture we share.

In this light Valadon's work is exceptional in at least two ways: 1) The female nude (which we will henceforth simply call "the nude") was "linked almost exclusively to male artists" (Betterton 251); 2) Valadon countered the conventions of the nude, which up to this

Edgar Degas. Reclining Nude. Musee de Louvre, Paris; Cabinet des Dessins. Giraudon/Art Resource, New York.

day have resisted the intervention of women artists (Betterton 251). We will argue that at least one Valadon nude interrogated and resisted these conventions.

Valadon's Reclining Nude and Degas' Reclining Nude are useful to compare, since they both depict a similar subject in a similar situation: a nude reclining after a bath. Both present the nude devoid of historical, religious, or mythological references (Betterton 263). Degas' nude is conventional in ways we will describe; Valadon's retains some of the conventions but departs from them also. These departures, we will argue, not only present unconventional ways of seeing the nude; they also reveal the conventions as patriarchal.

Compare the faces of each nude. Degas positions the left arm of his in such a way as to almost totally conceal her face. We see only a minimal suggestion of eyebrows and nose and one eye, which appears closed. For art historian Carol M. Armstrong, the combination of arm positioning and absence of detailing of the face negates any individual identity the "model . . . or woman" might have otherwise had; the figure's body is an object for male pleasure (230), the viewer positioned as a voyeur (Betterton 264; cf. Berger, Ways of Seeing, Part 1). In contrast, Valadon gives her nude a face that is, as Betterton writes, as "strongly and individually delineated as the body" (268). Valadon supplies a distinctive jawline, heavy eyebrows, and prominent nose. The eyes are not only defined but confront the viewer directly. Voyeurism is discouraged.

The nude by Degas positions the viewer as voyeur in other ways: Because he paints her one visible eye as a slight linear smear, the nude could be interpreted as asleep. As Betterton explains, "the viewer is [thus] given . . . access to a private moment . . . seeing a woman alone and caught unawares . . ." (264; italics added.) This is voyeurism by definition. Degas himself admitted that he painted his women "as if you [were] look[ing at them] through a keyhole" (Lemoisne, cited in Armstrong 239).

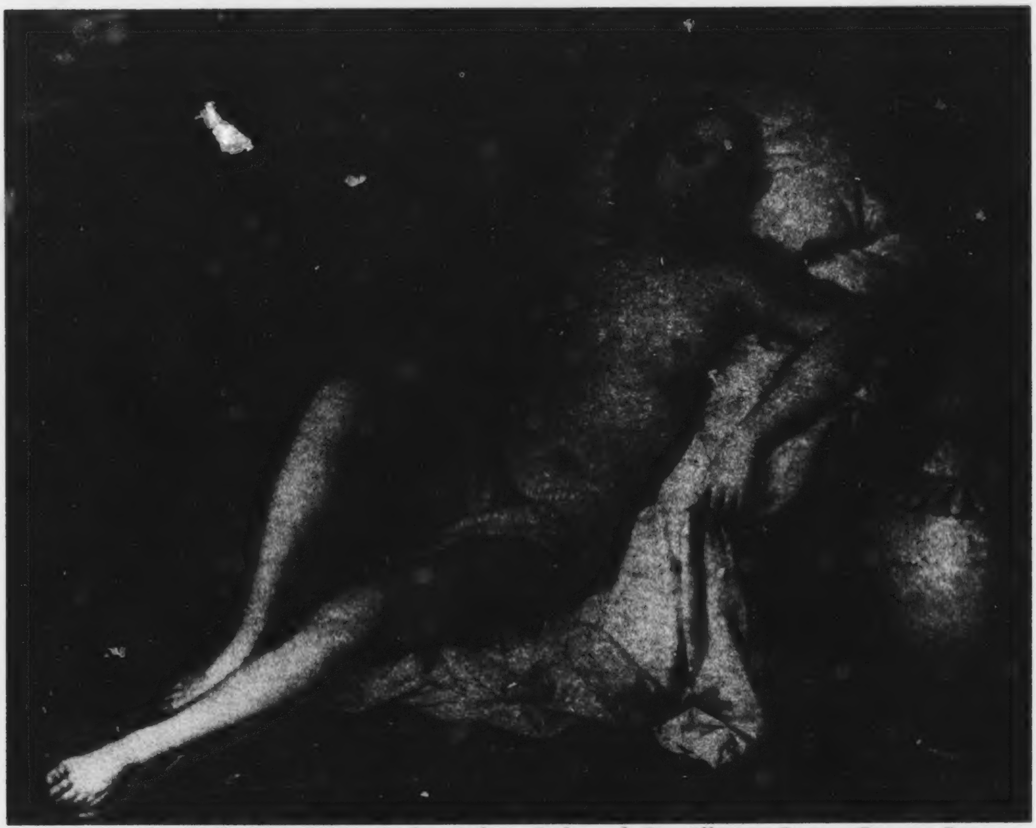
According to art historians Rozsika Parker and Griselda Pollock, such patently voyeuristic ways of seeing women were common in the 19th Century: Female figures were "frequently [shown as] asleep, unconscious or unconcerned with mortal things. . . . Such devices allow undisturbed . . . voyeuris[m]" (116). Contrastingly, the eyes of Valadon's nude meet the viewer wide-open and straight on, establishing a visual dialogue between the viewer and an individualized female figure (Betterton 263). Valadon's individualization of her nude goes beyond the detailing of the figure's eyes; as one critic noted "breast, thigh, wrinkle, [and] sagging stomach . . . are [delineated] with no less attention than [her] facial expression" (Dorival, qtd. in Betterton 268; order inverted for the sake of quotation). In moves that at once uncompromisingly individualize her subject and undermine the use of the figure as an object for male pleasure, Valadon first shatters the conventional continuity of her figure's torso with a sharp black diagonal line that divides the chest from the stomach. Then she builds the stomach higher than the ribcage, a decision that only stresses the stomach's fleshiness. What is more, a crease that distinguishes the figure's left cheek from the flesh above her upper lip and a bulge on her left arm also work against what Betterton calls "the idealized [slender and young] stereotype of the nude" (268). Contrastingly Degas figure shows no creases or bulges; her torso is a model of nude curvaceousness (Betterton 266).

This conventional curvaceousness is also reinforced by the difference in values between the lighter, one might say illuminated, torso, and the darkened lower portion of the body and arm-hidden head. We find it significant that the figure's head, the very sign of an individual identity, is triply obscured: Its darker value works together with the obscuring arm and lack of detailing to make the upper head quite literally nothing so much as a de-formed blob attached to her upper elbow. This de-formation also invites voyeuristic consumption of the torso.

The value differences that highlight the torso are echoed in the towel on which the nude rests. The towel's brightest expanse lies between the viewer and the illuminated torso. The viewer is thus invited to focus on her most sexual parts. In contrast, Valadon's nude is illuminated more uniformly; only a slight shift in value differentiates left from right, or, for example, upper breast from lower arm. Unlike Degas' towel, Valadon's offers no visual rhyme of the nude's torso. Rather the figure could be said to be using this prop to dry herself. The towel by Degas works to objectify his nude; the towel by Valadon works to individualize hers.

The two painters render backgrounds differently; Degas' nude and towel lay on a field of color on which no distinct pattern can be discerned. Not so with Valadon's. In their very detail, both the pattern and the folds of upholstery, and the decoration on the couch's frame may be said to offer the viewer as individualized a portrait of a couch as of the woman.[1] In her refusal to emphasize her model's sexual parts by means of light, or by means of placing them in the context of curve-echoing and invitingly-lit foreground- and bland background matter, Valadon discourages a voyeuristic apprehension of her nude. By doing the opposite Degas invites voyeurism. And again, the renderings of eyes and head could hardly differ more.

We concur with Betterton's assessment that in Reclining Nude Valadon's "acceptance of male definitions of art is undeniable . . ." But our analysis prompts us more to underscore Betterton's further claim that Valadon expanded the horizons of expressive possibility of the nude. Valadon's Reclining Nude does, indeed, "show that it is possible for women to intervene [in and alter for their own purposes a genre which has such a powerful tradition of male voyeurism as the nude . . ." (270). To this we would add that in discouraging



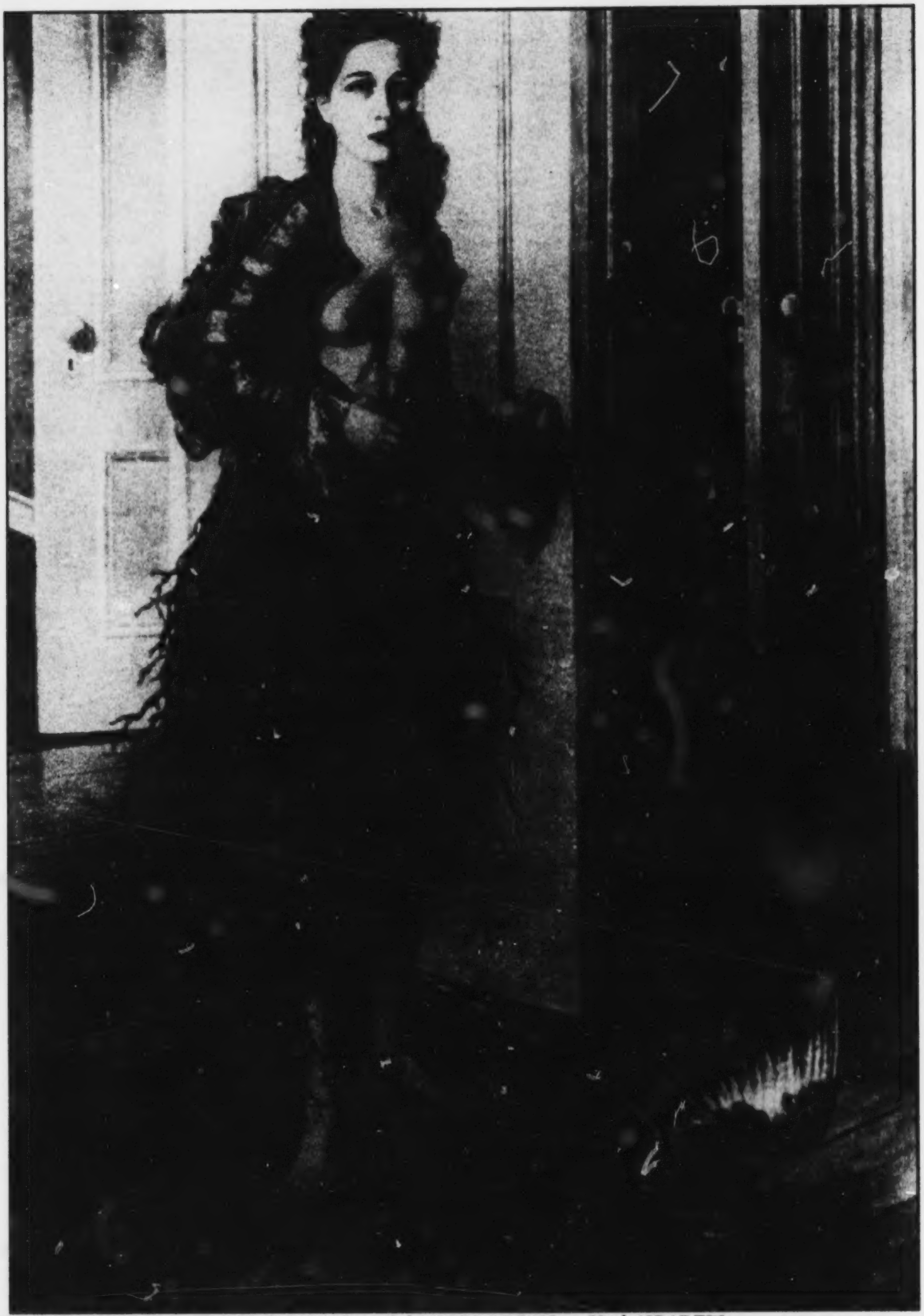
Sir Peter Lely. Nell Gwynne and the Infant Duke of St. Albans. Denys Bower Bequest, Chiddingstone Castle, Kent, U. K.

voyeuristic apprehension of her nude Valadon calls into question the patriarchal conventions of the genre.

Nakedness and the Conventions of the Nude

John Berger argues that by studying the nudes of European oil painting "we can discover some of the . . . conventions by which women have been seen and judged as sights" (47). The preceding analysis fortifies this position. For purposes of this discussion, a convention may be defined as a kind of unwritten contract between communicators and audiences that governs meaning (Katz 52). Berger argues that Nell Gwynne and the Infant Duke of St. Albans by Lely embodies the conventional way male, European oil painters saw women (52). The nakedness of Lely's female figure, Berger insists, is not "an expression of [the] actual feelings" of the person on whom the figure was modelled (52).[2] Rather, the nakedness of the figure is a sight for the spectator, who is male. "To be naked," Berger maintains, "is simply to be without clothes [and] be oneself. To be nude is to be seen as an object" for the use of males (53-54).

In contrast consider the woman's view of nakedness as presented in the image by Dorothea Tanning. Whereas there is little, if anything, about the figure Nell Gwynne to discourage male sexual arousal (Berger 52), the way the female in the Tanning painting is depicted hardly qualifies as the stereotypical image of male sexual fantasy. The Tanning figure is partially naked to be sure, but not nude as in the European oil tradition exemplified in Nell Gwynne and the Infant Duke of St. Albans. The following section will



Dorothea Tanning. The Birthday. Copyright 1991 ARS, New York/SPADEM.

describe how Nell Gwynne . . . encourages greater male sexual arousal while the Tanning image encourages less. In order to more fully explain how the conventions of nudity accomplish this, our analysis will move beyond the obvious difference that the body of Lely's figure is more exposed than the body of Tanning's. Accordingly we will consider such compositional variables as how the primary female figures are posed, who or what the secondary figures are, and how the different backgrounds in each image relate to the primary figures. If, after Berger, Nell Gwynne . . . is taken as a "highly typical" nude of the European oil tradition (52), then this discussion will also show how the Tanning image questions and deconstructs the tradition's patriarchal conventions. This section will be followed by some remarks on the pedagogical implications of our analyses.

Nell Gwynne . . . and the Tanning Image: Comparison and Contrast

Consider first the conventions besides the represented nakedness in these works. In Nell Gwynne the figure (who we shall call "Nell") is reclined, "passive[,] submissive" (Berger 52). She embodies what Armstrong calls "the langorous, curvaceous pose of self-abandonment, . . . the flirtatious glance[s], slick thighs[, torso-stressing expanses and] the [ideological] aestheticization [that together construct] the [patriarchal] pretext for the nude" (230, 233, 237; order inverted for the sake of quotation.) The term "aestheticization" refers to the cultural and ideological practice of rationalizing the nude as Art and as an exercise in such supposedly disinterested aesthetic issues as the distinguishing of line from shape (Armstrong 237; cf. Berger 11). Ideologically, however, Nell Gwynne . . . is neither artistically nor aesthetically neutral: It is an object for male sexual pleasure (Berger 52).

The conventions it embodies may be most productively grasped as meaning with an economy of scale. That they have persisted in painting as long as they have and are reproduced in mass media today testifies to their enormous cultural significance, their status as guides for the production and consumption of what until recently has been viewed as socially acceptable visual communications. To put this more concretely, because these conventions are culturally shared, it is neither difficult for members of our culture to recognize a nude nor render one if the technical means and a willing model are available.

The Tanning figure is unconventional because she stands, her left hand unpassively gripping a doorknob, her right an angled interposition between the viewer and her nakedness. Her unsubmissive, unlangorous, unself-abandoned uprightness deconstructs the conventions of nudity, unmasks their patriarchal basis. Her uprightness interrogates other conventions as well: In the history of images, verticality has been linked to the representation of males more than females (Armstrong 238).[3] The convention of representing the female nude as "fluid," continuous, and horizonal has been set against the practice of representing male bodies as "upright [and as discontinuously presented in] section[s] and [extensions, or as Armstrong calls them,] branche[s]" (Armstrong 237-38; italics added). Seen in this light Tanning's female not only is paradoxically male because she is upright but also because her body may be divided into three "section[s]": from the top of the head to the waist; from there to the bottom of the drapery cloaking her hips, thighs, and most of her calf; and the remaining lower calf, ankles, and feet.

And while she deconstructs patriarchal conventions of curvaceous, nude femininity on one hand and angular, clothed masculinity on the other, she both literalizes and metaphorizes this notion of "branched." A literal reading of the branch-like matrix descending from her waist is supplied by Schneede, who regards the matrix as representing some natural wood-like substance, such as branches or roots (132). For him the matrix as a whole signifies her "closeness to nature," (Scheede 132). A closer look, however, reveals that these extensions of her body take the form of branches, or rather parts, of female bodies hanging, some in crucifixion-like postures: A disembodied female breast and a disembodied leg are suspended from the matrix from which headless torsos also hang. One of these hangs from arms amputated above the elbow, two others are cut off from below the breast. "A closeness to nature?" Or, rather, a visual, metaphorical comment on patriarchal culture, its dehumanization of women and its practices of representing both genders?

Note the eyes of both figures: Both are directed at the spectator, but they differ. Nell's eyes may be said to be seductively inviting--by convention; in class discussions of these two images, students have tended to describe the look in the eyes of the Tanning figure as "scared" or "angry;" in any case, the eyes are not unambivalently seductive, not unambiguously inviting. In the Tanning, as in the conventional nude--as in Nell Gwynne--the gaze of the viewer and of the figure are at issue (cf. Armstrong 230). To address this issue let us assume that the Tanning figure's eyes, like Nell's, meet those of a conventionalized male viewer. And let us strive to interpret this image in a way that seeks to unify the multiple elements it presents (see Berger 13 and Culler 61).[4] If the assumption and interpretive strategy are allowed, then the meaning of the Tanning figure's eyes becomes like her uprightness and her drapery; her eyes are not merely and blankly unseductive or uninviting but rather deconstructive and confrontational; in their unseductiveness they confront the viewer and deconstruct the patriarchal basis of depicting and viewing the nude.

Contrast Nell's drapery to the Tanning figure's. Nell's genital area is covered but arguably in a way that evinces what art historian E. H. Gombrich calls the convention of revealing by concealing. The object of the represented cloth touches the part of the represented anatomy in such a way as to signify its presence. Here the shape of the drapery of her genital area visually echoes what it supposedly hides. In contrast what covers the lower half of the Tanning figure does not conform to the contours of what could have been represented otherwise as the lower half of her body. The link between the two parts of this raiment is more than physical: The nakedness/nudity (we cannot decide which) of the body parts-masquerading-as-branches may be seen as an ironic comment on the conventions of nudity that structure male spectator desire. Perhaps the irony may be best expressed verbally if the image could be made to talk. "You want to see the nude lower half of the figure?" it might be imagined to ask. "Look closely; I'll show you some unclothed female lower halves." The image supplies such lower halves, but in a way that not only discourages male sexual arousal but deconstructs and de-aestheticizes the genre's preoccupation with the female torso. The skirt extends this irony; a close look at its folds reveals them to be a series of concentric ovals that anatomically resemble nothing so much as the shape of the female orifice they simultaneously echo and hide. Thus the figure deconstructs male desire by gratifying it in the skirt mockingly and in the branches hideously.

In his discussion of the Tanning, Schneede gives no clue that any of these considerations had any role in his comment on the painting as a whole: "We sense that something extremely disagreeable might be about to happen, but we have no idea what form this menace will take or when it will manifest itself" (132). This perception of discomfort is reinforced by the figure of the winged rodent-mammal that crouches between the spectator and the female figure. Both the repulsive character of this creature and its positioning discourage male arousal. Both the character of this creature and its positioning make the prospect of an imagined sexual advance on her far less inviting than the character and the positioning of the Cupid-like figure of the boy-child standing behind Nell. Note, too, that the boy-child directs his gaze to where the spectator-male would direct his desire. In contrast the eyes of Tanning's rodent-like creature face the spectator squarely. They show nothing that ingratiates.

The creature can be said to touch the Tanning figure only if the conventions of perspective are spurned. This is an interpretive move other elements in the image discourage, such as the backgrounding of the doors and the play of light and shadow on the floor. In this light a distance between the female figure and the creature can be inferred. In comparison and in a conventional way (see

Armstrong 229), the Cupid-like putto behind Nell touches in a gesture implying its imminent removal the negligible matter revealing/concealing her genital area. It is a touch and, in Armstrong's phrase, "an invitation to touch," much as his look is an invitation to look (234).

With respect to the background, the open doors of Tanning's painting convey no certain suggestion of sexual availability. (And is the figure opening or shutting the door she grasps?) In contrast note the towering rise in the background of Nell Gwynne. Freud himself once reportedly said that sometimes a telephone pole, as presented in a dream or an image, is just a telephone pole. But if our interpretation of this image is ordered by the convention of unity, then the rise in the background may be said to symbolize, to metaphorize, and aestheticize the male sexual desire the image as a whole seeks to arouse.

Pedagogical Implications

Pedagogically these analyses are designed to do more than unmask the patriarchal ideology that transformed actual persons into objects for male pleasure. We make no claim for the originality of teaching the applicability of comparison and contrast to images. We do argue that lower division mass communication majors experience as new the sort of comparison and contrast offered above and that art students are not uniformly exposed to analyses that go beyond purely formal matters. Systematic, theory-powered, and theoretically-explicit comparison and contrasts of images are simply unknown to the lion's share of lower division mass communication and art students.

The preceding analyses also fix their view on what is in the images themselves (Berger 13). In contrast to most art historical discourses, these analyses do not rely on prior knowledge of the art historical periods into which the works studied can be fit. No facts about the Renaissance, Impressionism, or Surrealism were deployed in an effort to direct interpretation. No discussion of artistic authorship diverted the analysis away from its focus on "the relations of the parts [of each analyzed image] to the whole and [the] parts among themselves" (Riegel, qtd. in Olin 286). The lesson that focusing on the "evidence of the [images] themselves" (Berger 13) constitutes one visually literate means of interpretation cannot be over-emphasized, particularly to mass communication majors, who are exposed to popular criticism that often pays the lion's share of its attention to factors external to the image.

Finally, we are feminists. Along with Giroux, we believe that "schools are one of the most important sites where the construction of gender takes place, but can be challenged pedagogically" (6). We believe that "sexism . . . is a concrete force that affects women [and men and that] these effects need to be seen" and their painful consequences considered (9). We believe that deconstructive analyses of images are necessary in order to grasp their full cultural and political meaning. To paraphrase Giroux, "Making patriarchy visible as a form of oppression offers students [tools] they can use to criticize how patriarchal interests are produced within [visual] texts and social relations" (7). Images are an effect of those texts and social relations, and they affect them in turn. The once-veiled connections between gender and image are being unmasked; now we must examine them.

NOTES

1. Individualization of both her models and their surroundings is a mark of Valadon's authorship (Harris and Nochlin 261).

2. Other evidence for the existence of the actual person of Nell Gwynne may be found in Fry 32 and plate III, Fig. 6.

3. Consider in this connection Berger's oft-repeated dictum that in the world of images "men act and women appear" (47; his emphasis).

4. The interpretive strategy of seeking to bind together the multiple elements of any cultural presentation has been called "the convention of unity" by literary theorist Jonathan Culler. Interpretive efforts directed by this convention

"are not in any sense personal and idiosyncratic acts of free association; [on the contrary,] they are very common and acceptable formal strategies" (Culler 61).

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Incongruous Imagery in Art and Advertising

Joan Smyly Durden

Introduction

The purpose of this paper is to investigate the benefits of using incongruous, contradictory, and metaphoric imagery in conveying a message. The term incongruous will be used to explain examples of figure and ground which do not relate to one another perceptually or contextually. Contradictory messages deny or negate the content, i.e., the image or pictorial signifier contradicts the written message. Metaphoric messages fuse dissimilar objects into an unlikely union. Such messages are not nonsensible or meaningless, rather they create dynamics of perceptual and cognitive activity which heightens the impact of the message. First, the paper will discuss the historical conditions which led to an increased usage of incongruous imagery. Then the art movements, Surrealism and Dada Art, which are based on imagination and denial of reality will be addressed. Then it will investigate contemporary uses of incongruous messages in fine art. The paper will conclude with such imagery applied in advertising to capture our attention and promote consumption. The advertising images were chosen because of their allusion to the fine art images discussed in the paper.

Part I. Historical Background

The controversy of thought (imagination) versus reality is documented as far back as Plato's writings. In art, incongruous imagery appears in the works of the sixteenth century Italian artist Giuseppe Arcimboldo (1527-1593). His paintings of men's faces were comprised of the unlikely shapes of nature's bounty; vegetables, fruits, seafood, flowers, wild game. This creative fusion of man and gifts of nature is unique to this artist, and the results are termed "the Arcimboldo Effect" by art critics and art historians. "Head Composed of Faces of Animals" is an example of Arcimboldo's work. A contemporary painting with the Arcimoldo Influence is the 1990 painting "Some Like It Wet" by Doug Auld which can be seen in the October 1990 issue of Art News Magazine.

Before the twentieth century, there are few examples of incongruous or contradictory imagery. Usually early artwork was not allowed the luxury of free expression in that it was commissioned by the church or wealthy patrons.

During the eighteenth and nineteenth centuries, society valued the clear and distinct thinking of Descartes and Newton, but this philosophy was limited to reality and was finite. But also during the eighteenth and nineteenth centuries, the stability of the culture was undermined by the shifting of power from the church and the aristocracy to the industrialists and national structures. At the beginning of the twentieth century, three forces combined into a catalyst which destroyed the stability of European reality: (1)the societal force:the decline of the Grande Epoch which clearly defined the rights and restrictions of behavior, (2)the humanitarian force:World War I caused carnage and human suffering, and (3)the economic force:the burden of rebuilding Europe caused starvation and deprivation. There was such chaos that reality became an absurdity. The time was right for changes in society and philosophy.

The writings of Sigmund Freud and Albert Einstein proclaimed realities which were not finite or limited by absolutes. Sigmund Freud in his, *Interpretation of Dreams,* speaks of an attitude of the mind which abandons critical function and constraint of reason, and adopts imaginative thinking and free association. Freud states that positive results of such mind liberations are therapeutic experiences and produce creative surges of new ideas and artistic revelations. According to Freud, imagination is the key to understanding human behavior.

Albert Einstein's Theory of Relativity describes space and time which are not finite. Albert Einstein's scientific theory discounted Newtonian conventions.

Part II. Surrealism

The surrealist movement came about as a result of the psychological writings of Sigmund Freud and Carl Jung which describe an unconscious level unscathed by the restrictions of the conscious reality. There was a need to create a more humanitarian society to illuminate the darkness which had settled over Europe. The Surrealists, led by Andre Breton, believed in a new society based on an enlightened consciousness achieved by reaching the subconscious and unconscious levels. They visualized a mind shuttle to travel to the lower levels of consciousness and retrieve hidden information and bring it back to be used by the conscious level, to create a new reality based on the synthesis of reality and imagination. The desire to tap the unknown led them to experiment with drugs, hypnosis, deprivation, automatic writing, and dream analysis to alter the state of consciousness.

Max Ernst, the German artist working in the medium of photomontage, discovered that a media glut of disconnected images could send him into a daydream-like trance. He found that mail order catalogs provided images of technology and commerce arranged alphabetically instead of relying on causal or indexical reasoning. Flipping through several magazines gave Ernst a broad range of images to fuel his imagination, suggesting a reality beyond reason and cause and event.

Jean Paul Sartre supported imaginary thinking as a means of achieving personal freedom. He stated that imagination is a mode of consciousness which allows us to grasp and hold to something unreal and nonexistent and in this process we distance ourselves from the real world for a while and free ourselves of its limitations and confines (Murray, 1986, p.61). Meret Oppenhiemer's "Luncheon in Fur" 1936 is an intriguing composite of an object; the teacup is transformed by brown rabbit fur which has a textural surface incongruous for serving a beverage. This work emphasizes the Surrealist idea of a dislocated reality.

The intention of Rene Magritte, the Flemish Surrealist painter was to overthrow the definitive and to encourage visual thinking. His paintings create freedom of thought by the denial of perceptual reality. He is quoted in the exhibition catalog, *La Pense et les Images, Brussels, May, 1954,* "I consider valid the linguistic attempt to say that my pictures were conceived as material signs of freedom of thought" (Torczyner, 1979, p. 50). Magritte was influenced by such avant garde writers of the early twentieth century, as Sigmund Freud, the renown psychoanalyst; Andre Breton, the literary leader and spokesman for the Surrealists; and Michel Foucault, the French linguist. Magritte's "The Red Model II" shows shoes and feet which has a metonymic relationship, but the normal relationship of shoes and feet become a perversion. The image is a hideous transformation providing a social commentary: the sharp gravel ground alludes to the harsh conditions of Europe in the 30's. Magritte's "Carte Blanche" addresses the crux of Gestalt functions of perception. The positive figure against the negative area of ground provides the outline contour which is the strongest visual indicator in identifying an object. Magritte has contradicted the spatial definition of figure to ground. Areas which should recede advance, and he has overlapped areas which should be in the foreground. The title "Carte Blanche" suggests the artist's authority to use his own discretion in executing the painting.

Magritte's "The Treason of Images" addresses the same philosophy of linguist Michel Foucault, that language is arbitrary. Actually Magritte painted this work before he read Foucault's writings, but because their works followed the same vein of thinking, Magritte became a reader of Foucault, and they exchanged ideas in letters. The image proclaims the message prophetic to modern art; "This is not a pipe. This is a painting."The image signifies a pipe, and the viewer thinks "a pipe". But the caption states, "This is not a pipe". Magritte's biographer, Suzi Gablik, states that Magritte was influenced by Wittgenstein's *The Blue and Brown Books and Philosophical Investigations*. Certainly the contradictory delivery could suggest Wittgenstein's work, but A.M. Hammacher, in his biography of Magritte, states Magritte's writings never indicated he read Wittgenstein. Hammacher points out the similarity of Magritte's ideas with that of Ferdinand de Saussure, the linguist who pre-dated Wittgenstein and Foucault. Certainly this painting suggests the image is stronger than the written word and is more descriptive. Magritte's "Golconde" alludes to Saussure's theory that the signifier (the concrete word or pictorial message) is interpreted arbitrarily by cultural codes to mean the signified (the content or idea being conveyed), i.e. Magritte often used the image of the man with a bowler hat because to him it suggested Englishness and conventionality.

Magritte chose ordinary things to illuminate our vision to extraordinary levels. He disregarded the fantastic and the dream world, and chose shocking and surprising situations of ordinary objects to liberate our conventional vision.

Another Surrealist artist, Salvadore Dali, chose the fantastic and dream imagery. Dali's "Girls at the Slave Market with an Apparition of the Bust of Voltaire" depicts two paintings and two separate messages fused into one work. There are multiple interpretations: the viewer first sees the girls in the black dresses, then he must expel any reference in his mind of this image or message to be able to see the bust of Voltaire. The messages must be read separately and independently.

Part III. Dada Art

Another art movement brought on by the chaos of Europe during the 20's and 30's was Dada Art. This movement was begun by exiled intellectuals and artists residing in Zurich, Switzerland. They saw society as a cruel force on mankind with absurd demands lacking rationality and human dignity. Their goal was to destroy the old society and rebuild with a freer, more humane culture. Their means in destroying the menacing society was to break down communication, creating confusion and chaos thus short circuiting the power structure, much like the biblical parable of "the Tower of Babel". Marcel Duchamp's "The Bride Stripped Bare by Her Bachelors Even" is an assemblage of glass, oil paint, and lead. It is a metaphoric image of mechanical parts standing for the bride and her bachelors which are separated by a barrier. In *The Shock of the New* (1980), Robert Hughes describes this assemblage as a mechano-sexual metaphor. Duchamp chose a chocolate grinder and pistons to be an analogy for the male sexual apparatus. The characteristic of the metaphor is showing that dissimilar objects are the same. These mechanical devices are very different from human body parts, yet the modifying action points out the similarity. The frenzy of automation suggests sexual activity. The horizontal bar is a prophylactic barrier preventing the bachelors from reaching the bride; therefore, the bachelors are engaged in eternal masturbation, and the bride is a perpetual tease (Hughes, 1980, p. 55). Duchamp's work is referential to the frustrations and absurdities of life.

Metaphors provide surprising and enchanting unions of unlike objects. The unfamiliar becomes familiar, magically liberating the thinking process from the confines of logical reality and opening the door to poetic living (Murray, 1986). Metaphors are more than aesthetic indulgences. They provide the dynamics to break through predictions and categorizations. They encourage new ideas. I. A. Richards is quoted in Murray's *Imaginative Thinking and Human Existence*, (1986, p. 106): "The metaphor emphasizes sameness amid differences. The heat of the tension melts the walls or boundaries of previous categorization and causes them to run together. Out of the metaphoric analogy arises a sameness which is unsuspected and previously unrealized. It leads to the creation of new information about the subject."

Part IV. Contemporary Art

Claes Oldenberg, an American Pop artist, uses everyday, banal objects as the subjects of his sculptures. His modifiers contradict our preconceived notion of the object. The scale is often increased to "larger than life" scale. In Oldenberg's "Soft Toilet", the porcelain surface is suggested by the shiny vinyl material, but the firm structure of a cast iron object is shown drooping, which contradicts the form of the object.

Another contemporary American artist, Lucas Samaras enjoys shaking the sensibility of the viewer by contradicting the form with visual elements opposite of what one might expect. In "Chairs", Samaras shows two chairs which are usually a sign of relaxation, an invitation to sit down and rest; but, these chairs would be impossible to use. The surface texture would be horribly uncomfortable, and the angle of the legs would not support any weight. Samaras depicts another "Chair" in his Chair series which juxtaposes opposite modifiers (geometric/organic, smooth/rough, hard/soft, simple/elaborate) imposed on one chair. The opposites create a dynamic image which stimulates the mind by questioning the feasibility of such a chair. Samaras also worked on a series of boxes so beautifully decorated on the outside that the viewer desires to touch the boxes and open them to find more beauty inside. The inside of the box delivers a surprise message of exposed razor blades, broken glass, and knotted tinfoil. The tinfoil reminds the viewer of the painful experience of biting down on tinfoil with a filled tooth. The lovely invitation to investigate the inside of the boxes deals a frightening and painful experience.

The March 1983 issue of Art in America featured an article on William Wegman, a Contemporary artist, whose medium is photography. In this article the art critic Craig Owens compared Wegman's work with that of Roland Barthes. "Neither is a master, reasserting the kingly structures of our culture. Barthes acts as a pawn making relentless forays against the king- the classical, doxical, scientific and masculine space of our inherited culture. Barthes used writing as his subversive weapon. Wegman uses laughter to undermine certainties and to discredit dogma" (p.106).
Wegman chooses his pet Weimeraner Man Ray as his subject. In Slide 14, Wegman's "Elephant", Man Ray is masqueraded as an elephant and photographed in glossy prints to simulate an Old Master oil painting. The dog loyally complies with his master's whim but with a bit of chagrin. By choosing a subject other than himself Wegman avoids the narcissistic trap of featuring himself as the subject of his photos and videos. By using an embarrassed but loyal subject, Wegman heightens the absurdity of the content. The artist and the viewer have a joke at the dog's expense. Sigmund Freud identified the dream as the "royal road" to the unconscious, but he also stated that the joke was another mode of access.

Part V: Advertising

The gap between fine art and mass media imagery has closed since the Pop Art Era. There exists a reciprocal influence between the two forces. Advertising has always mimicked fine art, and in recent years, there has been an increase in the influence of Surrealism upon advertising. Advertising images must capture the attention of the viewer and communicate a message which calls for a response to the product. Competition for the viewer's attention is keen. We are constantly bombarded with commercial images via magazines, television, billboards, and packaging. Extra dynamics are needed to achieve the competitive edge. Incongruous imagery provides a jolt to the brainwaves to assist our remembering the product.

Sigmund Freud stated that the subconscious is the source center of generating our wants and desires. Advertisers very often target this illusive facet of the viewer's psyche. Touch this level to promote the desire to buy and consume goods.

John Berger, in *Ways of Seeing,* states that advertising promotes a feeling of inadequacy within the viewer's consciousness. The viewer's anxiety causes him to believe advertisers' claims; "Buy this product to fulfill your life and make yourself glamorous and enviable", i.e. the Cinderella syndrome in which a personal transformation occurs by the purchase of a particular product; or the Enchanted Palace promise to transform relationships by creating an enviable environment through buying a whole ensemble of products (Berger, 1972, p.145).

Publicity, as Berger refers to advertising does not suggest the present but rather the future. The present is boring, but the future is promising and intriguing. Incongruous imagery is often used in advertising because it denies the reality of the present and suggests a reality in imagination. In one Budweiser advertisement of bathing beauties on a beach blanket, the ground defies space similarly to that of Magritte's "Carte Blanche".

Advertisements often refer to fine art in order to validate the product with a sense of "tried and true" images. A Kikkoman salad dressing ad which used the Arcimboldo style of creating a face from various vegetables. Others were delightful metaphors of hands disguised as animals selling watches and jewelry for Lord & Taylor.

John Fiske in *Introduction to Communication Studies* (1982) discusses the risk of using the metaphor as a mode of communication in that it may result in aberrant decoding (different interpretations occurring from varied cultural backgrounds). To prevent multiple interpretations, the metaphor intended for a broadcast mass audience should be presented in the most evident form in order to reach "the lowest common denominator" of the public sector. This lowering of standards to achieve conventional understanding causes the metaphor to lose its subtle yet powerful impact. Some metaphors are becoming cliches, such as mustangs standing for masculine cigarette smokers. Although Fiske warns of the possible negative responses to metaphors, i.e. elitism and inaccuracies, but he states that our culture is becoming more homogeneous and, therefore, "There is currently a style of Surrealist advertisements which approximate much more closely to verbal metaphors in that the difference is exploited as much as the similarity" (Fiske, p. 97).

Visual experiences are more memorable and more exciting when there is an unexpected setting or reference. A message with a unique twist provides a momentary escape from a banal reality and a longer memory of the image.

Appendix:
List of Slides Used in the Presentation of Paper

1. Guisseppe Arcimboldo, "Head Composed of Faces of Animals",(1527-1593)
2. Doug Auld, "Some Like It Wet" Art News Magazine, October, 1990
3. Meret Oppenhiemer, "Luncheon in Fur" 1936
4. Rene Magritte, "The Red Model II", 1937
5. Rene Magritte, "Carte Blanche", 1965
6. Rene Magritte, "The Treason of Images" 1928-9
7. Rene Magritte, "Golconde", 1953
8. Salvadore Dali, "Slave Market with an Apparition of the Bust of Voltaire", (1904-1988)
9. Marcel Duchamp, "The Bride Stripped Bare by Her Bachelors Even" 1915-23
10. Claes Oldenberg, "Soft Toilet", 1966
11. Lucas Samaras, "Chairs", (1939-)
12. Lucas Samaras, "Chair"
13. William Wegman, "Elephant", Art in America, March, 1983.
14. Budweiser Ad of Bathing Beauties on a Beach Blanket
15. Kikkoman Ad of Garden Salad in Arcimoldo Style
16. Lord & Taylor Ad of Hand disguised as Zebra
17. Noblia Citizen Watch Ad of Hands disguised as Seals
18. Noblia Citizen Watch Ad of Hands disguised as Panthers
19. Noblia Citizen Watch Ad of Hand disguised as Ram

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HyperText Programs at Work: Designing the SIUC Electronic Film/Video Catalog Using Apple's HyperCard

Jerry Hostetler

Ted Nelson, who coined the phrase hypertext, defines it as "non-sequential writing— text that branches and allows choices to the reader, best read at an interactive [computer] screen." What has not been answered yet is what role hypertext is to play in education and communications. One general conception is that hypertext's primary strength is to make information accessible to the viewer from an almost infinite number of different perspectives (see Byles, p. 61, Figure 1, for example). It seems clear, however, that before what some view as a revolutionary transformation of how we handle the accumulated knowledge of mankind can take place, new strategies for dealing with the complexities of this new development must be put into place. What is unclear and yet to be researched is whether or not there are paradigms and algorithms which can be applied to hyper-environments that all or most humans can efficiently assimilate. It would be a very interesting exercise to give ten people trained to design hypertext applications the same information and then see how comparable the strategies would be for providing the user access to the information in the hypertext programs they designed. In a word, it would seem that a further study of the *semiotics* of the hypertext environment is in order.

Some Practical Considerations

It is interesting to note that instructional development considerations are no different for hypertext than for any other media. Indeed, instructional hypertext applications undoubtedly require even more consideration because of the possibility for providing complex interactions between content and user. This is not to suggest that this new technology will earn any greater consideration than other forms of instructional media. Provisions for making available the time and expense for development, providing incentives for the development of exemplary hypertext programs, including release time and rewards, and providing the necessary expertise for purposeful development seem no more imminent for development of instructional hypertext programs than they have been for the development of other instructional applications, including computer-assisted instruction using authoring systems, or the development of locally-produced educational media.

Consequently it may be left once again for entrepeneurs to attempt to develop generic instructional and training hypertext applications which may not meet specific educational and instructional needs. This may be especially critical as hypertext applications become hypermedia applications. Perhaps the greatest promise of the hyper-environment is the ability to interface hypertext with other powerful forms of media, motion and static. The expertise most likely is not available at the elementary, secondary, and post-secondary levels to insure that locally-produced hypermedia applications adhere to sound instructional development principles.

This is not to suggest that hypertext is not of immediate and practical value. What has been shown is that hypertext programs are easy to design and if designed well, easy to use. A plethora of popular, experimental, and theoretical discourses attest to the widespread acceptance of this recently popularized phenomena.

Designing the SIUC Electronic Film/ Video Catalog

Film/video libraries, much like

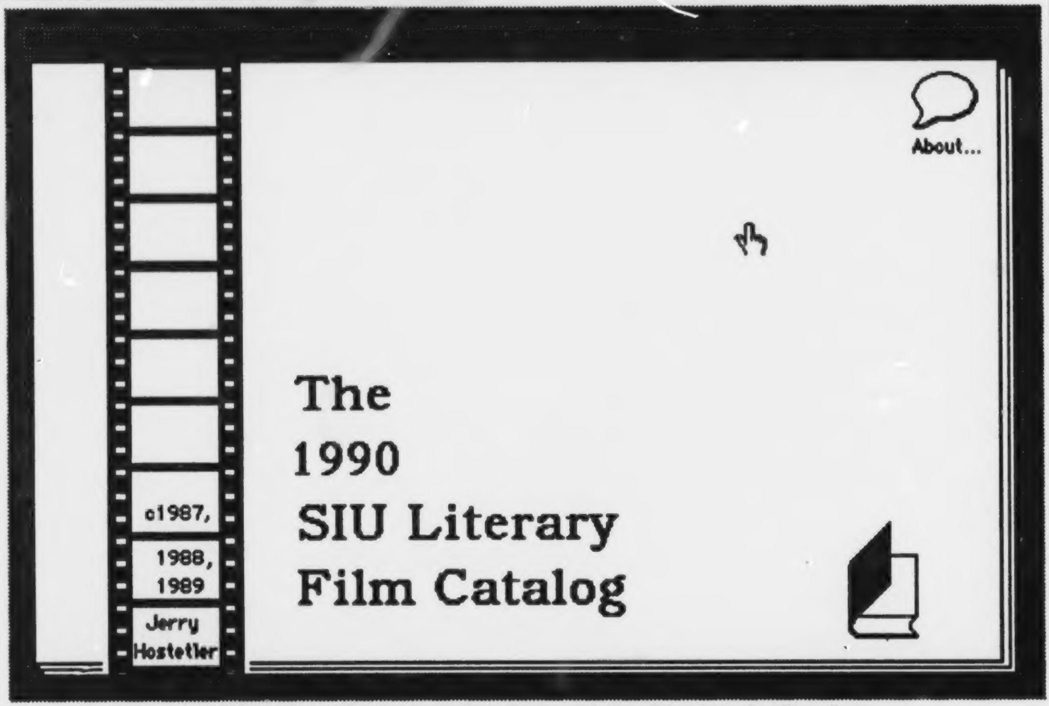


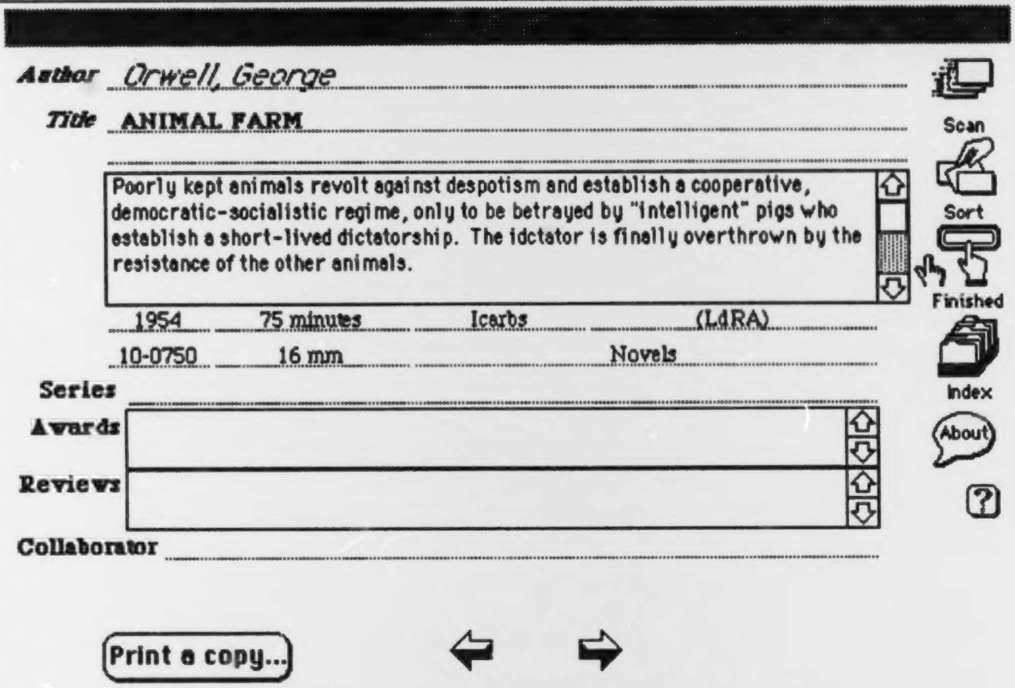
Figure 1. An example of one of the Electronic Catalogs.

print libraries, add materials to collections on an almost daily basis. Unlike print libraries, however, the total number of acquisitions is probably considerably less. This makes it possible to up-date the data base on an almost daily basis, and can result in a listing which is current almost daily.

Apple's HyperCard was used to create the *SIUC Electronic Film/Video Catalog* (Figure 1). The *Electronic Catalog* is a listing of the approximately 3000 films and videotapes currently in the university's circulating collection. The *Electronic Catalog* exists as a database accessible to patrons on a Macintosh computer. It is intended to replace the traditional paper copy of the film/video catalog.

The advantage for the producers of the *Electronic Catalog* is that it can be easily and quickly up-dated (on a daily basis, if desirable). Another desirable characteristic is that the database can be used to produce paper copies and special subject area catalogs. The *Catalog* can also be distributed on floppy disk, and it is easy to provide custom "catalogs" for the user.

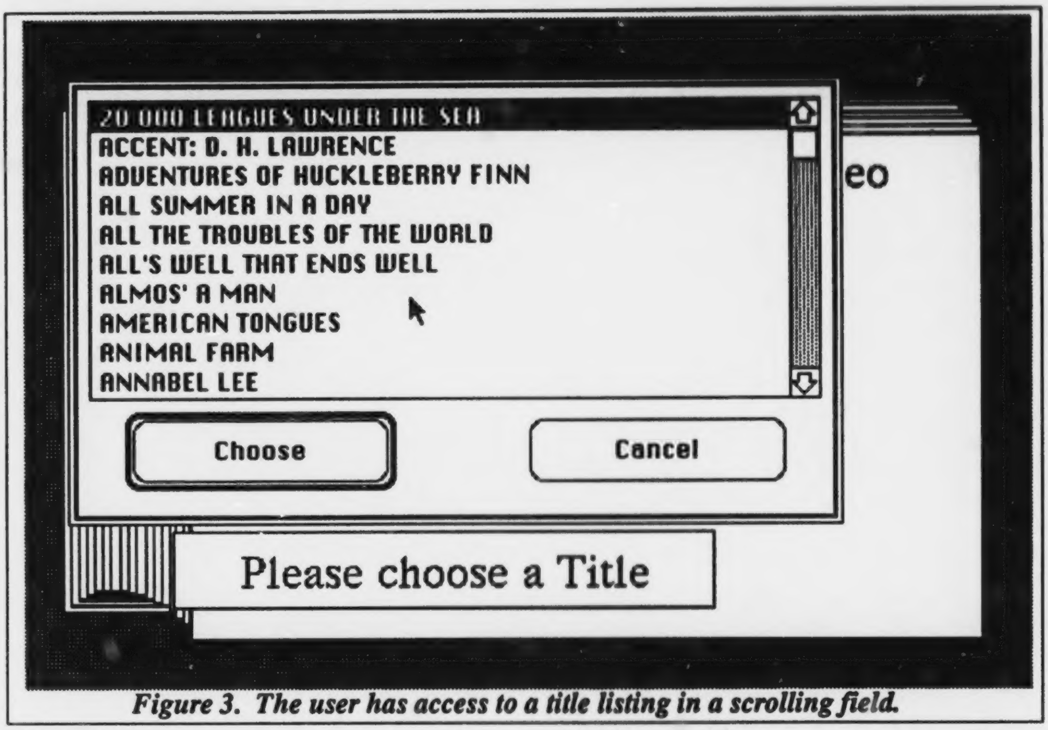
The advantages for the user of the *Electronic Catalog* include the ability to sort the database by any one of a number of fields (title, production date, distributor, series, etc). A user might, for example, be interested in recently acquired films and videotapes. This is easily accomplished in a *The Electronic Catalog* by clicking the


Author Orwell, George
Title ANIMAL FARM

Poorly kept animals revolt against despotism and establish a cooperative, democratic-socialistic regime, only to be betrayed by "intelligent" pigs who establish a short-lived dictatorship. The idctator is finally overthrown by the resistance of the other animals.

1954 75 minutes Icarbs (LdRA)
10-0750 16 mm Novels
Series
Awards
Reviews
Collaborator

Figure 2. A number of "buttons" appear on the cards which allow users to sort by fields such as Author, Title, or Date, for example.



20 000 LEAGUES UNDER THE SEA
ACCENT: D. H. LAWRENCE
ADVENTURES OF HUCKLEBERRY FINN
ALL SUMMER IN A DAY
ALL THE TROUBLES OF THE WORLD
ALL'S WELL THAT ENDS WELL
ALMOS' A MAN
AMERICAN TONGUES
ANIMAL FARM
ANNABEL LEE

Please choose a Title

Figure 3. The user has access to a title listing in a scrolling field.

"sort" button and selecting "year" as the sort field (see Figure 2). The cards in the stack are automatically sorted by date, usually in less than 60 seconds. In the literature stack, cards can also be sorted by author.

One other feature of HyperCard is the ability to search fields by a key word. If, for example, an anthropologist wishes to see film/video titles in which Lewis Leakey might appear either in the title or the description, the term "Leakey" can be typed into a "dialogue" box, and the user will be taken to any card(s) in which the term appears either in the title or description.

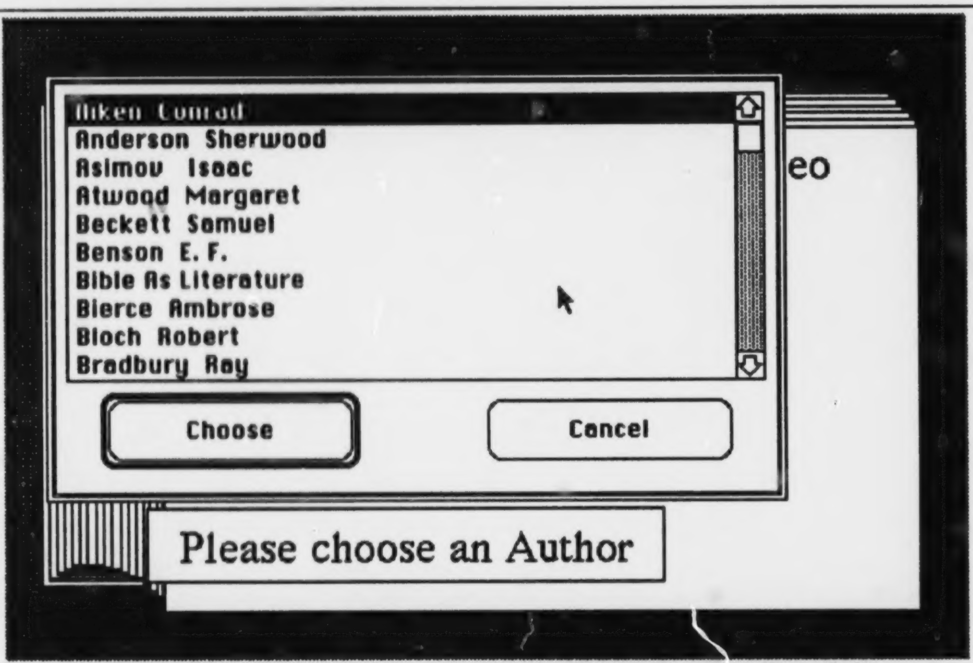
The Electronic Catalog is an excellent illustration of the power of the new, highly touted *hypertext* programs. These software programs can be tailored to the needs of anyone interested in developing short or long bibliographies, or for managers of small-to-large media collections who need an easily developed and easy-to-maintain database.

Special Features

A number of special features have been built into the *Electronic Catalog*. Not the least of these is the ability for the user to "click" on key words in the scrolling fields incorporated in the stack to see if they occur in other other titles available in the collection. This allows the user the ability to get instant cross-reference indexing to all the titles in the collection (Figure 3), or all of the authors whose works are represented in the collection. It is also possible to allow the user to construct individualized notations referencing specific key words or concepts. For example, in the literature catalog the user has access to a comprehensive listing of all authors and titles (Figure 4). It may also, however, be advantageous for the user to construct notations about where very specific works might be found. The work of Shakespeare provides a useful example: the user can construct specific title notations containing specific Acts and Scenes from the corpus of Shakespeare's work available on film and video in the film/video collection.

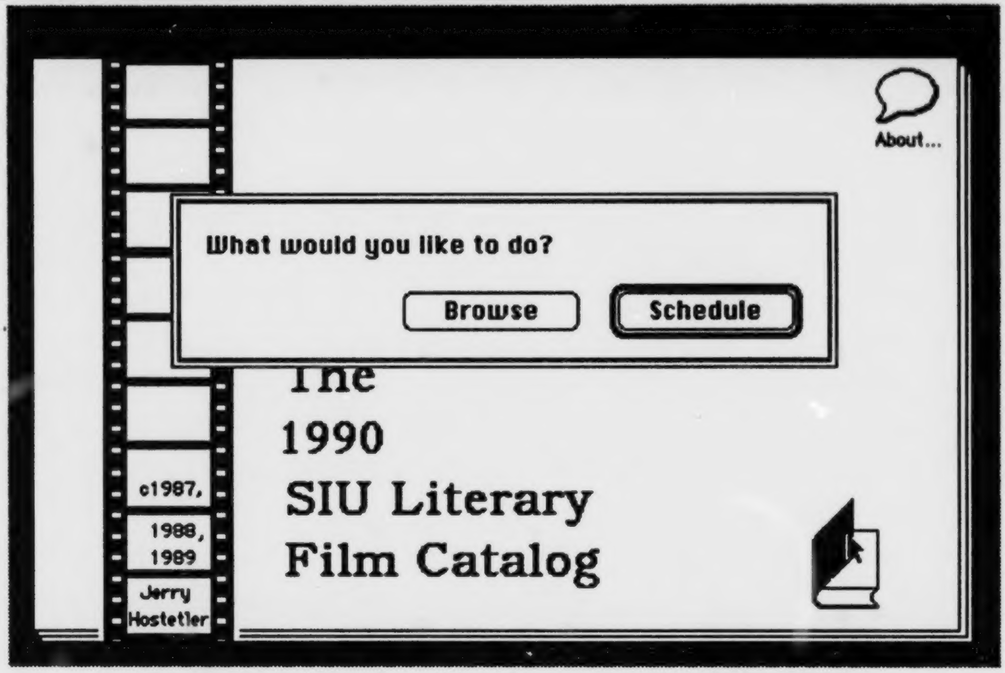
These same design considerations can be applied to other subject areas. The developers of the catalog construct user notations which may be of general interest, but individual users may also construct individualized lists and notations of sequences from different films and videotapes which may be of interest to their particual discipline. These features are currently being constructed in each of a number of subject catalogs already available.

Another feature currently incorporated in the *Electronic Catalog* allows the user to construct a list of films and videotapes and schedule them for playback. A button on each card makes it possible for the user to add a title to the list from the stack (Figure 5) . When the user is finished, information about playback dates, times, and places are requested. A printout is supplied to the user and to the film schedulers. It is not yet possible to provide immediate confirmation, but this capability will no doubt be available at some later date.



Please choose an Author

Figure 4. The user has access to an author listing in a scrolling field.



What would you like to do?

The
1990
SIU Literary
Film Catalog

©1987,
1988,
1989
Jerry
Hostetler

Figure 5. The Electronic Catalog allows the user to schedule films/videos.

Future Plans

As the various operating systems's software move closer to compatibility, it is clear that developers can optimistically project that work done in one environment will soon operate in other environments, including mainframes. In that world, one would project that a college instructor at SIUC could sit at an office terminal and summon the *Electronic Catalog* up on the screen. By manipulating the data in various ways, the instructor could construct a personalized catalog of the films/videos available for classroom use, schedule the program for classroom playback, and get immediate confirmations.

As large databases become more widely available, it should also be possible some day to access these from offices.

One final consideration for film/video libraries is the problem of archiving films and videotapes. With the advent of low-cost video for instructional use, the use of 16mm film has declined. Many films which might be of research or historical value are being lost. Once a program no longer has any commercial value, producers and distributors withdraw these titles from their catalogs. Data bases such as the Electronic Catalog described here can assist in keeping track of sole sources andbegin the task of archiving these materials for posterity.

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When Historical Photographs Contradict History: The Calculated Visual Legacy of the Waffen-SS

David Perlmutter

INTRODUCTION

Photographs have long been used to ornament lexical communication in history books and historical documentaries. Yet, the photographs are rarely treated as historical documents, worthy of methodological critical and formal analysis. This contributes to the commonplace that photographs are neutral, phenomenological units of discourse; confirming whatever they show. They are treated, to use Gross and Worth's term as "*non-sign events* ... events that we ignore, or code 'transparently' (1985:2). The problem is that photographs are not neutral original sources, but as subject to the bias in creation, survival or presentation as any other sources of history. In examining the visual' legacy of the Waffen-SS (The military wing of the World War II German SS) we see that the historical photograph cannot be judged in isolation from the circumstances of its authorship and its viewing.

ELEMENTS AND CONTEXTS OF PHOTOGRAPHIC MEANING

In contemporary western society the symbols of the Third Reich, the swastika, the SS runes, even the name "Adolf Hitler", still capture our gaze as a modern cultural phenomenon, or they would not adorn the covers of so many mass market novels and teasers for television movies. However, these images and symbols were originally intended not just to attract the eye but to support an ideology. For example, consider this photograph. (Fig 1.)

Paul Byers writes that a photograph is "the raw material for an infinite number of messages which each viewer can construct himself" (1966:30). The question arises, then, are certain elements in a picture more commonly used to construct meaning than others? Are our choices limited by the elements chosen by the photograph's creator -- the mise-en-scene of the image? We can inspect the **inner observational elements** within the photograph and make informational, personal and psychological interpretations. Beyond this we are affected by the **outer contextual elements**: cultural, visual and lexical that surround all units of discourse. These contexts work as multilayered physical and mental *captions* , surrounding photographs, affecting our interpretation.

If asked to give the briefest, most 'neutral' description of the inner *informational* elements of Fig. 1, we might say, "It is a picture of a man sitting on a tank." At this point, *personal* interpretation might intrude; someone might recognize the figure and recall a face-to-face encounter. With historical photos this is unlikely. *Psychological* interpretation of his body, posture, bearing and facial expression -- his look -- is another common avenue of interpretation. We note that he wears a smart, well decorated;

black military uniform. His legs are crossed casually as if he were relaxing at a cafe. His cap is cocked jauntily. He gazes into the distance; it is the 'far-flung' gaze we often see on military posters. He smiles -- or is it a smirk? One path of interpretation might have us conclude that this is a supremely confident soldier, reflecting on battlefield glories past or future.

However, when asked, "what do you see," we cannot avoid using outer contextual elements such as *cultural associations*. Allen Sekula argues that the "meaning of a photograph, like that of any other entity, is inevitably subject to cultural definition" (1982:84). We observe culturally important details in the picture: the Iron Crosses, the twin 'lightning flash' SS runes on his collar, the Death's Head on his cap, and a partly visible cuff inscription: "Adolf Hitl-". The historian will identify him as a member of the Waffen-SS (the military wing of the SS). For many western observers this information is enough to form meaning. Many of us now see a Nazi, a man who pledged himself to die for Adolf Hitler. Another viewer sees a dashing officer of a legendary elite fighting unit. Both 'realities' may simultaneously be true; one does not negate the other.

At the same time we are affected by the *visual context* in which we witness the image; photographs are a mass culture product and we rarely encounter them in isolation outside the laboratory. Each day we are witnesses to innumerable pictures vying for our attention. When we remark on this mass imagery, they are not just commenting on just sheer numerical constraints as, say, when opening the pages of a book we see many words. Their concern is with 'meaningful differences' between images. For example, Jameison relates how a TV advertisement for Nixon appeared just after a picture of a monster from a horror series, and concludes that the visual context "in which political ads appear infuse them with meaning often contradictory to their creator's intention" (1989:415).

It follows that mass produced images containing carefully circumscribed visual elements surrounded by similar, non-contradictory images have a greater chance of achieving the purpose of their creator. The Third Reich was not ignorant of this principle. Hitler himself intoned, "Only after the simplest ideas are repeated thousands of times will the masses finally remember them" (1943:185). Anthony Rhodes writes of the Nazi wall poster campaigns: A man could look away from Hitler's gaze but "He ran into Hitler again around the corner. No inhabited place in Germany was without him..." (1987:22-3). In Nazi Germany and to a lesser extent in occupied Europe, visual contexts were circumscribed and contradictory images banned.

However, even when images collide the 'meaning' of their synthesis is often defined for us by *lexical captions* which may or may not be accurate.These include the written captions under the photo in a book or narration in a documentary. The power of these to guide our understanding cannot be under-estimated. Our interpretation of a picture changes when we are told something extraordinary surrounding its creation. Obviously, changing the caption can change the meaning of a photograph. It follows that the caption writer, either the original photographer, the subsequent archivist or the modern day author or publisher have influence over our view of the image.

THE HISTORICAL & CULTURAL CONTEXT OF THE WAFFEN-SS

Photographs thus are neither created nor viewed in cultural vacuum. In order to understand the 'original' meaning of a photograph, we must understand the institution, society and/or individual which left them to history. In this case, we begin with understanding the history of the Waffen-SS and its parent institution, the SS.

SS leader Heinrich Himmler believed that the SS man's race should be pure, physical characteristics should be superior and ideology should be anti-Judeo-Christian. He created traditions and holidays to coincide with appeals to a mythic "Germanic History." Honor was loyalty to Fuhrer, Volk and flag. Rather than surrender, an SS man should die gloriously as did the Goths around their king at Vesuvius. Himmler took particular care that all the symbols, imagery and especially personal regalia of his order would support the mythos (Reider 1975).

By the invasion of France in 1940 the fighting or armed wing of the SS, the Waffen-SS was formed. These units, initially all German, were intended to serve as political soldiers (Hohne 1971:440). After the early Nazi victories in Scandinavia, the Low Countries and France, Himmler began a program of recruiting "Germanic" or "Nordic" peoples into the Waffen-SS. Catastrophic losses during the Russian campaign forced a massive extension and of this program and small "foreign legions" were amalgamated into the organization's ranks. In 1943, membership was officially opened to non-Aryan peoples. Some, such as the Asian-Indian Legions, were only intended for propaganda purposes.[1] Others, such as the Belgian Wallonian Legion, became crack troops. At its peak, 950,000 men served under the SS runes (Hohne ibid:2).

Motivations for enlistment ranged from high combat pay to lust for glory to believing in the 'European crusade against Bolshevism' slogan trumpeted by SS recruiting agents. Some soldiers were pressganged, others volunteered. Some recruits were disappointed by the extended length of service.[2] Others did not adapt well to the rigorousness of German Officered training schools.[3] Many, enlisted believing that, after the fall of France, the war was essentially over and they wished to buy prestige for their countries in the new European order.[4]

The Waffen-SS separated itself from the regular army by its appearance, ideology and conduct. SS units wore a different uniform; camouflage in the field, black on parade; and most sported the twin lightning-flash "SS" runes on their collars. All Waffen-SS troops received National Socialist indoctrination. Finally, the Waffen-SS has been accused of committing war crimes (Stein 1966:Ch. 10) (Sydnor 1977:Ch. 9.). Foremost among the charges is the association with units specially employed for the purposes of mass murder including the personnel exchanged between the field units of the Waffen-SS and the concentration camp service (Segev 1989:70). Waffen-SS combat units have also been accused of crimes against Allied prisoners of war, most notoriously the shooting of American prisoners at Malmedy in 1944.

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[1] Hitler: "The Indian legion is a joke. The Indians can't kill a louse, and would prefer themselves to be devoured." "The Austrian Ruthenians were pacifists. They were lambs, not wolves." "It is idiocy to given weapons to a Ukranian division which is not completely reliable."
(From the minutes of a conference, March 1945. Cited in Stein 1966:194)

[2] "A most serious grievance was that foreigners who had volunteered for one year service in the Waffen-SS, during the early stages of the foreign movement, were not being released at the end of their enlistments." (Stein ibid:158)

[3] "Drawn from a variety of countries and with a variety of ideologues, the SS volunteers suddenly found themselves under training by a force of strict Prussian drill-sergeants reared in the blinkers of Totalitarianism." (Hohne ibid:476)

[4] However, the apple of post-war independence was only offered on wall-posters. Hitler himself stated: "When speaking to the Germanic races of the North-West and north one must always make it plain that what we are building is the Germanic Reich, or rather the Reich with Germany constituting her most powerful source of strength, as much from an ideological as from a military point of view." *Hitler's Table-Talk, 1941-1944: His Private Conversations.* (Trans: Norman Cameron & R.H. Stevens) Weidenfield & Nicholson 1973:402-3)

At the same time units of the Waffen-SS earned themselves excellent military reputations among allies, enemies and modern scholars.[5] These reputations turn even sober historians into poets: Of the war on the Eastern front, Heinz Hohne writes:

> They won for themselves a select place in the annals of war. Whether in the South, the center or the north, where ever the enemy recovered sufficiently enough from his surprise to stand and fight, when ever he launched counter-attacks and tore gaps in the German attacking front, orders went out for the SS formations. (ibid:466)[6]

Nevertheless, the International Military Tribunal at Nuremburg ruled that the Waffen-SS "was as much an integral part of the SS organization as any other branch of the SS." (Nuremburg: 1949-1951:XXII:282) Before the court, Waffen-SS defendants and their lawyers claimed that the organization was linked to the SS only in name and that its duties had been purely military and separate from the atrocities attributed to the other branches of the SS (Stein ibid:250).

The mainstream cultural definition of men who wore the SS runes has always been unfavorable. They have been typecast as comic book villains in the popular media -- black-clad symbols of the evils of Nazism. Mainstream historians have dubbed them *The Soldiers of Destruction* (Snydor 1977) among other epithets. This censure is not a purely historical artifact but a living modern political and social phenomena. Our view of, say, the Huns, may not be favorable, but a man parading down the street in the garb of Attila would receive stares and laughs; the same man in a Waffen-SS uniform might provoke a riot. The cultural caption, then, applied to the visual image of the Waffen-SS appears beyond rehabilitation.

In sum, the mainstream historical and popular definition of the Waffen-SS was for many years contradictory but generally unfavorable.

The pictorial legacy of the Waffen-SS, however, remains as a visual rebuttal of such negative labels. The tension between these two polarities is the topic of this paper, especially since it is a commonplace among viewers to attribute to photographs a phenomenological basis for authority.

THE VISUAL CONTEXT OF THE WAFFEN-SS

Since the 1950s, the veterans have attempted to revise the 'verdict of history' and reestablish the Waffen-SS mythos: to define the Waffen-SS as military organization that deserves honor for its achievements on the battle field, particularly the claim to having saved Western Europe from Communist domination. Their works take the form of unit histories, biographies, guide-books to battle fields, and combat memoirs.[7] These are characteristically special edition works, printed on acid-free 70 pound paper with hardback binding and high quality photographs. Their unifying thesis is summed up by the title of ex-Waffen-SS general Paul Hausser's book *Soldaten wei Andre Auch: Der Weg der Waffen-SS* (Osnabruck 1966) -- *Soldiers like Any Others: The Journey of the Waffen-SS.*

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[5] For example Marcel Bigerd, one of the French Commanders at Dien Bien Phu "remarked that if he had had 10,000 Waffen-SS troops he would have won the battle!" Source: Ed Janz. "French Foreign Troops in Indochina." *The Military Advisor*. Summer 1990:24

[6] This verdict is not unanimous among historians. see: Madej, Victor W. (ed). 1985. *Hitler's Elite Guards: Waffen-SS, Parachutists, U-Boats*. Game Publishing Company. Allentown. Sections 1-IV give another view of the military value of Waffen-SS. "[T]here is little evidence to substantiate that the Waffen-SS was either more effective or more courageous than similarly equipped army formations. The key to their apparent success was due to mainly to preferential treatment in supply allocations of equipment and petroleum. The SS divisions could count on a much higher level of attachments than their army counterfeeds. In addition a large portion of the units were motorized whereas most army units were not." p. 25

[7] Charles Syndor, Jr. the leading modern analyst of the Waffen-SS comments that the apologist literature resulted in, "the establishment of a myth, widely believed in non-academic circles in West Germany today, that the Waffen-SS were just "soldiers like any others." "The History of the

Yet, it is the photographs the Waffen-SS took of themselves that are the key weapons in winning this final battle on the western front. To a younger American and British audience the tedious memoirs of generals are not as fascinating as the photographs of the soldiers displayed in English language Waffen-SS photography and regalia books. Almost all the books' authors/collators directly or indirectly deny nefarious intent. Sometimes the photos are presented without moral comment, though in these cases the blurb on the back cover or the captions of the photos makes the point of view clear. For instance, the back cover of Brian Davis' book, *Waffen-SS*, announces "The photos are specially selected to show SS troops under combat conditions, as well as at important functions, such as parades and in training."

Often authors specifically claim they have no moral, symbolic or political intent. In *Uniforms, Organization and History of the Waffen-SS, Vol. 2*, authors Bender and Taylor write: "Both authors deeply regret the fact that certain of our readers interpreted...a sympathetic and biased approach to the subject. This impression is naturally, totally false." They claim their books are "an objective and unbiased study of an organization that ceased to exist..." (Bender & Taylor/1971 Vol. 2: intro).[8] In the case of the Bender & Taylor series Forwards and Dedications are made by Waffen-SS veterans themselves. Another statement is that the cause and the soldier are divisible, and that we should not be judgmental. Bruce Quarrie, the leading photo-regalia Waffen-SS author, states in *Hitler's Teutonic Knights: SS Panzers in Action*, that it is, "more than usually true" in the case of the Waffen-SS, that "history is propaganda written by the winners" (1976:7).

Moreover, audiences for the photographs exist. The modern Waffen-SS photograph and regalia books, in the United States are not supported by a HIAG type organization but rather a small but vociferous buying public. Whereas in Germany the publishing of Waffen-SS apologias may have a vanity press aspect, in the west it is a true market-based proposition. These books have been successful, many extending into multiple editions and reprints due to the support of a particular 'buying public'. The books are usually sold through mail order, from military book publishing houses, by specialty dealers at book fairs or at stores devoted to historical boardgaming. The appearance of a Waffen-SS comic book series leads to a second conclusion: some part of the audience must be young.[9]

THE AESTHETICS OF WAFFEN-SS PHOTOGRAPHS.

At Nuremburg, Hitler declared, "Art is the only enduring investment of human labor" (Hinz 1979:iii). Nazi film, sculpture, paintings, posters and photographs were vital spiritual and political expressions of national policy. A calculated iconography was constructed to

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SS Totenkopfdivision and the Postwar Mythology of the Waffen-SS". *Central European History*, VI(4), December 1973:340-341

[8] It is important to note that this kind of statement altogether different from any other type of "history book." No one who wrote a work on, say, the Huns, feels required to state in his introduction, "In no way is this book trying to eulogize these long dead warriors. This is simply a book of history. Any claim that I am a proponent of Hunnic ideology is preposterous."

[9] The writer is currently completing a study that included projective interviews with people who collect and read Waffen-SS photography and regalia books.

establish their regime as inheritors of a grandiose past and the permanent guardians of a heroic present. Photography was a primary tool in the struggle since recent technological developments had allowed the creation of sturdy, lightweight cameras well suited to the battlefield.

The wartime photographs were shot by the 12,000 photo men (enough to fill a division) assigned to follow German army and SS formations at home and in combat.[10] The Waffen-SS pictures were published in SS journals like *Der Schwarze Korps (The Black Corps);* or mass market publications like *SIGNAL*, the German military magazine also intended for foreign consumption; or in various commemorative books, postcards and stamps. The official Waffen-SS photographs, the ones sanctioned by the SS and preserved in archives, today invoke the myths that were the symbolic superstructure of the organization.

As said, Himmler saw the SS as the new nobility of Europe. The Waffen-SS was the military symbol of this theoretical construct. Like any photos created by an institution concerned with its public image, the published photos were a calculated legacy, purged of anything unflattering.[11] Shortly before the end of the war many of the photographs and most negatives disappeared. As is true of most anti-institutional groups, the enemies and victims of the SS, such as partisans, took few pictures of them.

Waffen-SS Photos are 'coded' in Waffen-SS, and to assess their 'meaning' it is necessary to understand the aesthetic principles and symbolic values they were based on. The following analysis, thus, must be seen as interpretative observation rather than statistical survey.

This strategy, often methodologically problematic, is less so in dealing with pictures from the Third Reich, because its aesthetic principles are well known, grounded in Western tradition, and its visual arts, including photography, were, as said, intentionally repetitive and simple. Hitler believed art should show "frozen, clear forms" without ambiguity (Grosshans 1983:93). Waffen-SS photographs are clear and free of ambiguity, if taken at face value. They were intended to be propaganda at four levels:

(1) **The informational level** (what are the physical objects in the picture?) The meaning: 'Here are our men on the front.'

(2) **The psychological level** (what can we tell about their characters from their appearance and 'look'?) The meaning: 'These men are honorable, elite soldiers as is shown by their regalia, equipment and bearing.'

(3) **The symbolic level** (What cause these men fight for?) The meaning: 'They were a glorious international European army fighting against an evil enemy as is shown by their diverse origins and their defeated Soviet enemies.'

(4) **The higher ideological level** (What *political* creed inspired these men to fight?). The meaning: 'These men were inspired by National Socialism and belief in the Fuhrer.' Here, the association is made by our cultural definition since 'motivation' is not easily ascertained by photographs.

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[10] Giselle Freund relates of Heinrich Hoffman, Hitler's personal photographer,"When the war broke out Hoffman organized a central photographic bureau in Berlin where all photographs taken at the front were sent for approval. He selected only those he deemed most appropriated for German propaganda" (1980:134).

[11] In preparation for a larger study the writer visited the BundesArchiv in Koblenz, West Germany. Leafing through the vast photo files one chances upon photographs of kitten playing with strings, soldiers posing next to pretty native girl, that is the kind of photos one would see among the files of any soldiers away from home, or any tourists for that matter.

The levels do not automatically merge; we can can look at these pictures, accept they are not 'faked' and show brave, heavily armed and medaled, elite soldiers without also believing in Nazi ideology. In fact, at this time the writer is conducting a study, interviewing people who read Waffen-SS photography books, my preliminary observations are that this leap *is not* made; the audience *accepts* these men are brave soldiers, but *does not automatically support the government they fought for*.

In sum, the photographic legacy of the Waffen-SS stands in contradiction to its negative mainstream definition.

THE PHOTOGRAPH AS A PRIMARY SOURCE OF HISTORY

Most Waffen-SS photographs are not 'faked' in the sense of darkroom chicanery. Neither are the photographs "inaccurate" in details of setting, time or the appearance of the subjects. However, like any photograph, they only express the moment the photographer, his informants and his editors choose to create.[12]

It is part of any historical, political or social inquiry to question the motivations and methodology of so-called "secondary sources," that is previous writers (Clive 1989:Intro). The biases of historians may be apparent from their works or from contemporary criticism. The veracity of "primary sources" is more problematic, especially in cases where no competing artifacts exist. Such sources have a perceived greater claim to authenticity due to the temporal proximity of their creation (and often their creator) to the events or peoples being studied. Photographs are always primary sources unless they are photographs of other pictures.

Every institution wishes to create its own history or myth -- that is the prescribed dominant meaning that an observer would draw from viewing its culture. Often this is done by an appeal to the past which links the modern institution to some great person, event or theoretical construct of olden days (Lincoln 1989). This can be established by selection, creation, falsification or destruction of the historical verbal, written, or pictorial primary sources. The result is that what survives is not necessarily representative. Any attempt at a cliometric or quantitative form of historical research is dependent on asking by what pattern of events did a particular set of primary sources survive? Is there something systematic which caused these artifacts to be preserved? Such inquiries necessarily begin with the question: ***Whose interests do these sources serve?***

Sometimes a distortion is accomplished by the positive dissemination of an "official story". Also an institution may create its history by negative measures -- destroying or editing artifacts. This is best accomplished when the institution controls the fate of surviving primary sources. Falsification is not necessary when winnowing will do. For instance, in Classical scholarship there is a continuing debate over what documents have been altered during centuries of copying and recopying. As the forged "Donation of Constantine" attests, *primary sources are never original sources*.

It is a cliche that the dominant culture always controls the 'verdict of history' by controlling its primary sources and their distribution, or bluntly: That *history is written by the winners*. This means that the victors of a war, a proxy fight or an ideological, cultural, religious or any inter- or intra-institutional conflict will write the history of their struggles. The defeated lose their ability to define themselves to succeeding generations. They are dumped, as Trotsky derided the Mensheviks, "into the trashbin of history." In the case of the Waffen-SS, pictorial history is being written by the losers, and this 'history' contradicts our mainstream assumptions. As the temporal distance increases from the events they depict we may speculate that the images' power to define history will commensurately increase.

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[12] It is easy, when discussing institutional selection, incorrect captions or cropped images, to fall into conspiratorial tautologies. It is more convenient for the researcher to announce that everything is caused by large scale forces. However, we are reminded that history and society are affected by chance and circumstance and, yes, natural factors that have no relationship to institutions or class struggles. Marx himself noted that at least part of the historical record has been edited by "millions of gnawing mice."

IMPLICATIONS: THE USE OF HISTORICAL PHOTOGRAPHS TO TEACH HISTORY

This investigation demonstrates that we cannot treat the historical photograph as a non-sign event, unworthy of inspection and debate. On the other hand we cannot, for the sake of our students and ourselves, become cynical rejectionists, throwing up our hands and crying that everything is biased. Rather we should infuse ourselves and our students with the notion that photographs can be used for historical inquiry and instruct us about the attitudes of their creators. However the process of interpretation must proceed along methodical and inquisitive lines.

This belief is well summed up in R. F. Delderfield's *To Serve Them All My Days*, in which the teacher cautions his students not to embrace automatically the lesson that the English Civil War's outcome was good, just and natural. For if the King had won, the teacher points out, his people would have written the history books and a Royal victory would have been taught as been good, just and natural to generations of schoolboys. As educators we must encourage critical awareness of *all* sources of history. The inquiry, as said, necessarily, begins with the question: whose interests do these sources serve?"

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Fig 1. (Bundesarchiv, Koblenz)

Visual Literacy for Engineers

Craig L. Miller
Gary R. Bertoline

Introduction

Sylra Read Taylor (1987) said, "Definitions of literacy fluctuate. Between and even within cultures, literacy has disparate meanings. To some educators, the definitions must depend on a determination of the need and function within the society. Others advance a more traditional view, tying the concept of literacy to strict standards" (p.458). The American educational system and the American public as a whole have traditionally related the idea of literacy with the ability to read printed material. The ability to read and comprehend printed material is arguably one of the most important skills needed for one to successfully survive within American Culture, but by itself reading ability will not allow an individual or society to properly function.

Park (1981) defined literacy in terms of relative and absolute literacy. Absolute literacy is defined as the amount of years of school, achievement on criterion-referenced or standardized tests, or achievement of criterion competencies such as reading a short paragraph and answering questions pertaining to the paragraph. Relative literacy is concerned with literacy needs of individuals within a changing technological society with an attempt to keep individual literacy at such a level that one will be able to successfully function within the society. Both types of literacy are important for individuals to be able to function within our society, but not enough emphasis is placed on relative literacy by the educational system.

Visual literacy can be considered as one form of relative literacy. Visual literacy is very important for individuals who live in our visually based society. The focus of this paper will be the examination of the notion of visual literacy. More precisely it will examine the importance of visual literacy for engineers and currently how most engineering curricula do not emphasize or even include curricula that develop visual literacy abilities in engineering students. Lastly, a conceptual model of visual literacy for engineering education is advocated.

The Importance of Visual Literacy

The United States must develop higher problem-solving skills within its youth so that America can stay competitive with other technology-advanced countries. Central to the development of higher problem solving skills is the development of visual literacy. Visual literacy is very important for individuals in many diverse professions. Visual literacy attributes are important for the seemingly unrelated areas of achievement in mathematics (Maccoby & Jacklin, 1974), chemistry (Talley, 1973), biology (Lord, 1985), and science (Small & Morton, 1985). Data of the United States Employment Service show that eighty-four occupations employ persons who possess visual literacy skills in the top ten percent of the population. Engineers, scientists, drafters, and designers represent eighty-five percent of these occupations.

Although visual literacy is indeed important for many occupations, secondary schools and universities continue to emphasize a verbal approach to learning (Horton, 1982). Bertoline (1987) notes that students are given little or no formal instruction in visual literacy. If the goal of our educational system is to educate successful individuals for various professions, instructional approaches must be developed that allow students to augment and advance their visual literacy skills.

Visual Literacy In Engineering Education

The engineering discipline is undergoing a significant transformation due to the combined effects of rapidly changing computer technology and competitiveness of the world economy. Engineers now possess tools that allow them to create more complex designs using sophisticated analysis techniques such as CAD (Computer-aided design), finite element modeling (Figure 1), solid modeling, simulations, dynamic animation, data base tools, and general data visualization capabilities. Workstations and distributed data bases are being used by industry to integrate the entire business from the initial design ideas through the manufacture of the end product. The graphics interface is common to all of these various tools and provides the engineer with a highly productive system to solve design problems.

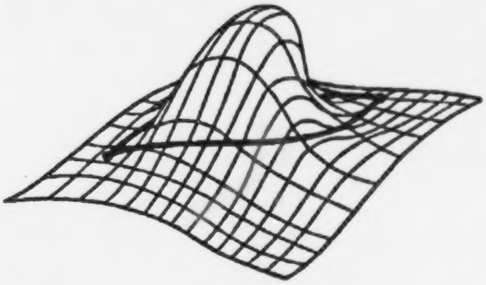

Figure 1. Finite Element Analysis,
(Mortenson, M. E. 1985, p. 306)

The improved technology and the pressures of the world economy are changing the needs of industry which in turn impacts engineering education by requiring a better educated and more productive engineer. Groups that monitor and advise engineering education such as the ASEE (American Society for Engineering Education), ABET (Accreditation Board for Engineering and Technology), and NSF (National Science Foundation) all agree that the entire engineering curriculum needs to be reevaluated in light of the evolving computer technology and the expanding role of the engineer to take part in a process that in multi-disciplinary, open-ended, and visually centered.

Jensen (1986), found in a survey of professional engineers in educational and industrial settings based on the concepts of engineering graphics, found that visual literacy concepts are one of the most important attributes that a person should possess to be successful in the engineering profession. Engineers and engineering educators also agree that one of the most important graphics skills that an engineer should possess is the ability to visualize. Presenting abstract conceptual ideas graphically through the use of sketches, mechanical drawings, and CADD data bases is a fundamental tool used by engineers (Simoneau, Fortin, and Ferguson, 1987). Representing the world graphically is a fundamental communications skill used by engineers to change their conceptual designs into sketches or engineering drawings (Voland, 1981). Because visual literacy concepts have been and continue to be so important, most engineering education programs have included introductory graphics courses as a basic component of their curricula (Bertoline, 1987). Visual literacy is developed in engineering students through various means, but the formal educational setting for the development of visual literacy often has been found in engineering graphics. Simoneau, Fortin & Ferguson (1987) claimed that there are two main goals for engineering graphics:

1. To teach the technical graphics language
2. To develop students' ability to visualize and solve problems in three dimensions (p. 5)

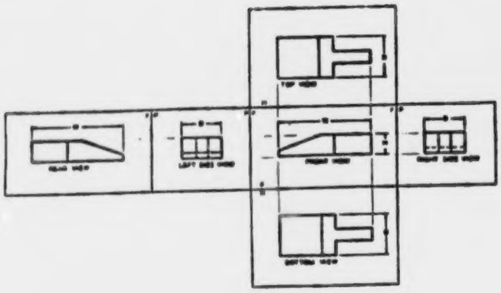

Figure 2. Orthographic Projection.
(Earl, J. H., 1983, p. 238)

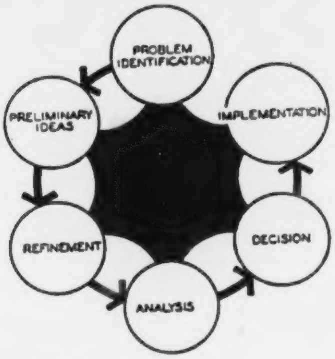
PROBLEM IDENTIFICATION
IMPLEMENTATION
DECISION
ANALYSIS
REFINEMENT
PRELIMINARY IDEAS

Figure 3. The Design Process.
(Earl, J. H., 1983, p. 24)

Engineers are creative problem solvers who apply science and technology to the solution of problems. The solution to a problem originates in the mind of the designer through clear mental images. This mental imaging is dependent upon the visualization ability of the engineer. Engineers document their mental images and communicate them to others through engineering drawings. Engineering drawings are based on sophisticated projection techniques (Figure 2) that have taken hundreds of years to develop. These projection techniques requires a high level of visualization ability. The graphic representation or modeling of design solutions are used throughout the design process (Figure 3) and are the fundamental component for design and production. Engineers depend heavily upon visualization to ideate, refine, and document solutions to problems.

The conceptual model shown in Figure 4 identifies the major components of an engineering graphics curriculum. Visualization is one of the three learner capabilities identified by Bertoline, et al. (1990) as being an important component in engineering graphics instruction. The three-dimensional representation of the model is an attempt to show that visualization cuts across the entire engineering graphics curriculum. The reason visualization is so important for the engineer is based on two mental processes:

1. Engineers begin problem solving by generating and manipulating mental images.
2. Engineers must document and communicate their mental images using projection techniques to create hand or computer generated drawings.

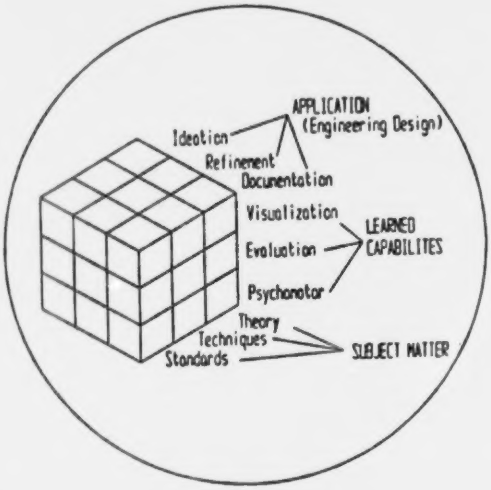
APPLICATION
(Engineering Design)
Ideation
Refinement
Documentation
Visualization
Evaluation
Psychomotor
LEARNED CAPABILITIES
Theory
Techniques
Standards
SUBJECT MATTER

Figure 4. Engineering Graphics Conceptual Model

Both of these processes require a high level of visualization ability. There are many historical examples that deomostrate that the most creative engineers and scientists were extremely proficient at mental imaging. Albert Einstein once said:

> *The words or language, as they are written or spoken, do not seem to play any role in my mechanism of thought. The physical entities which seem to serve as elements in thought are certain signs and more or less clear images*

> *which can be voluntarily reproduced and combined... the above mentioned elements are in my case, of visual and sometimes muscular type. Conventional words or other signs have to be sought for laboriously, but only in the secondary stage, when the above mentioned associative play is sufficiently established and can be reproduced at will* (Hadamard, 1949).

Typically an engineer will generate an image of the problem solution in his/her mind. This phase in the design process is called ideation. Ideation is the process used by individuals to communicate to oneself when exploring and generating new ideas. Controlling clear mental images is only the first phase in the design process that depends on visualization. The engineer must document through sketches these fleeting images in the mind. An engineer will sketch the three-dimensional mental images on two-dimensional paper (Figure 5). The mental transformation necessary to sketch 3D images onto 2D media depends heavily on the visualization ability of the engineer. Typically these sketches are in the form of rough pictorial drawings. Sketches are used throughout the design process and is the dominant form of communications used by engineers to solve problems (Ullman, et al., 1989).

After the engineer settles on one or two solutions to the problem through successive mental iterations, more sketching, and other problem solving strategies, the design must be refined. Refinement is the process used by engineers to analyze or investigate proposed designs. Ideation drawings or models usually develop into a focused single idea. The drawings can be in the form of abstract design layout drawings or sophisticated computer models. The abstract design layout drawings use a projection technique called orthographic projection. Orthographic drawings are created by imagining that the viewer is positioned at infinity from the object and the lines of sight are parallel to each other. This is done for the six principal views of the object which are mutually perpendicular to each other. Creating orthographic views of imaged designs requires a high level of visualization ability. The refinement stage of the design process is heavily depended upon drawings and visualization abilities.

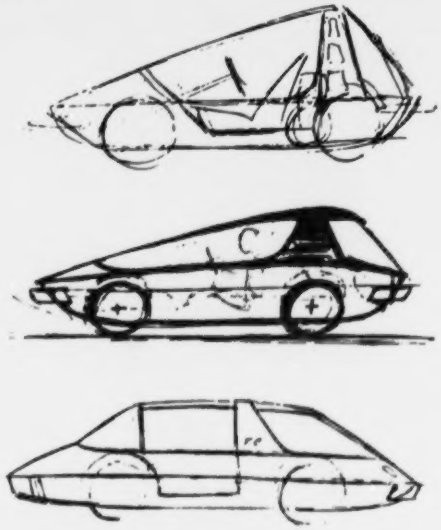

Figure 5. Ideation Sketches
(Earl, J. H., 1983, p. 46)

The final stage of the design process documents the solution using many different types of drawings, some of which are quite abstract. Documentation (Figure 6) is the process of recording a design solution using accepted standards. Although the engineer rarely will create the document drawings, an engineer must check or "read" the drawings for accuracy. This stage also requires a high level of visualization ability.

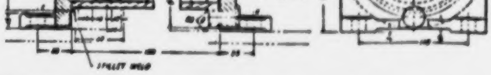

Figure 6. Documentation Drawing
(Luzzader, W. J. & Duff, J. M., 1989,

Engineers must be visually literate to be successful designers. Unfortunately our educational process does not require formal visual literacy instruction at any level. Consequently many freshman engineering students lack the basic visual skills necessary to be successful in engineering graphics or engineering. The task of improving the visualization ability of engineering students occurs within engineering graphics courses. For many years the engineering graphics profession has viewed visualization as an important part of their curriculum. However, the profession is beginning to realize that visualization is the most important cognitive learner capability necessary for success in engineering graphics. More importantly, visualization ability is the foundation for creating clear mental images in engineering design especially when using computer tools for modeling. Visual literacy is an extremely important component in engineering education. Engineering graphics can be used as the vehicle to deliver the visualization instruction necessary to prepare future engineers to be visually literate.

Conclusion

The application and utilization of various forms of visual communication and visual imagery are an important part of our culture. The use of visuals and of technology related to the production of visuals raises social issues in many diverse areas. Many of the problems of society are solved through the application of engineering principles. Problem solutions must be visualized in order to be solved, thus engineers must be visually literate. Without experiences in engineering graphics, our future engineers may not be visually literate.

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The Doll Icon

Gretchen Bisplinghoff

CODED REALITY

Film "reality" is constructed out of cultural figures, objects, behavior patterns and relationships, understood (often on an unconscious level) through a system of social and artistic codes and conventions. As Julia Lesage points out in her article on "S/Z and RULES OF THE GAME":

> ...cultural objects and patterns, such as dress, food, and drink, artifacts, traffic, architecture, etc...are the extracinematic material which forms the very stuff of narrative film, as do conventionally determined forms of verbal and gestural expression and human social interaction...the film narrative, image, and sound track both incorporate and also shape cultural conventions.[1]

Specifically, coding of the elements depicting the character of the madwoman in film (particularly mainstream Hollywood melodrama), her verbal and nonverbal behavior, are part of the process of this presentation of cultural detail: the details that may go unnoticed as part of the process of the narrative reality of her existence which reveal the boundaries and definitions of the character's life. They reveal parameters and culturally coded messages of limits and expectations on the madwoman. In particular, the norms which establish the parameters of her sanity and insanity are specifically defined in terms of her sexual identity as a female, as defined by culturally coded limits. And examination of the presentation of the figure of the madwoman in films from the forties (SNAKEPIT) through the eighties (FRANCES) reveals a remarkable consistency in the coding of the character.

Filmic presentation of the myriad of details of the character's existence as a part of an ongoing stream delineates culturally coded and understood elements. These tend to go unnoticed as part of a "realistic" filmic portrayal:

> In daily life and in art, conventions establish what is probably, plausible, or obvious. They provide whole clusters of seemingly natural details, and the fact that these details and the conventions behind them are unremarkable means that ordinarily we do not notice or discuss them, that they are lost until named.[2]

The social and artistic conventions shaping this "realistic" presentation according to Roland Barthes include consideration (among others) of elements of character, setting, dress code, gesture, and movement, as well as the more general codes of cultural reference—"cultural codes which the text explains (the rules of the game), which it assumes we know (masculinity/femininity, the psychology of persons of certain types, ages, nationalities, professions, etc.) or which the author or characters just mention in passing. . ."[3] The naming of such codes delineates the cultural boundaries of the madwoman's insanity on a conscious level of understanding of the underlying power structures. In this coding process:

> The trivia of everyday life—touching others, moving closer or farther away, dropping the eyes, smiling, interrupting—are commonly interpreted as facilitating social intercourse, but not recognized in their position as micropolitical gestures, defenders of the status-quo—of the state, of the wealthy, of authority, of all those whose power may be challenged. Nevertheless these minutiae find their place on a continuum of social control which extends from internalized socialization at one end to sheer physical force at the other.[4]

Nonverbal cues, in particular, "play an extremely important and complex role in the maintenance of the social order."[5]

TOYS AS CULTURE

One such nonverbal cue which operates as part of the cultural coding within film images involves presentation of toys within the composition. Toys appear as part of the myriad of background details; but toys, dolls in particular, contain, express, and evoke, strong, culturally conditioned responses. In a recent study, Brian Sutton-Smith points out that it is "clear that toys are matters of considerable cultural importance, not just something that children play with."[6] He further indicates that toys are a "cultural form of communication. They are like words which we use to mean things to each other. Play is a form of human communication and so are toys."[7] Our responses to toys are based on centuries of associations. Through associations with play, toys appear as part of inferior, perhaps even deceptive activity. Historical associations with triviality and deceptiveness still appear in dictionary definitions of "to toy": "Thus 'to toy' is (to): be amorous, be flirtatious, toy with another's affections, be full of trifling tricks, be wanton, be a trifler, be a toyer."[8] Also, the division of work and home as a result of the Industrial Revolution established the world of the child as separate, with literature, clothes and objects of their own. As no longer part of the work force, their lives and objects are forever "childish and trivial in the eyes of the general public."[9] Thus, though the toys are vehicles of idealization, both in form and as symbol of pleasure not work, the "dominant view of toys has been that they are an intrinsic part of and symbolic of the childishness of the play world. They are the object of immaturity, as well as its definition."[10] And, more importantly, within this definition lies the implicit connotations of powerlessness and need for outside control connected with both the toy and its owner.

MADWOMEN AND DOLLS

Madwomen play with dolls: the doll appears as a recurring icon within the presentation of the character of the madwoman throughout mainstream Hollywood films, primarily melodrama in this study, from the forties through the eighties (SNAKE PIT, 1948; RAINTREE COUNTY, 1957; SUDDENLY, LAST SUMMER, 1959; FREUD, 1962; WHAT EVER HAPPENED TO BABY JANE?, 1962; SISTERS, 1973; A SAFE PLACE, 1971; FRANCES, 1983, etc.) She may play with it overtly, and it operates as a direct symbol of her condition, or it may simply appear as part of the background detail of her life that visually explains the causes and cures of her illness. No such element appears consistently as part of the portrait of madmen in film, indicating initially the consistent and unchanging nature of the depiction of the madwoman, and the codes, symbols and structures constructing her presentation. The icon of the doll as part of the depiction of this complex character (who collapses, condenses and contains many important issues concerning the image of women in film, as well as raising issues concerning the presentation of gender-based and gender-biased images of madness in film) operates as an instant and ongoing identification of the madwoman's status and her problems, based on sexual identity.

Although insane, or perhaps because they're insane, madmen in film appear as very powerful figures as they create great art, rule countries and even command the forces of life and death. However, in what would also appear to be a very powerful role for the female onscreen, the madwoman's appearance is consistently undercut by such nonverbal coding as the use of the doll. The use of such an icon with the madwoman speaks volumes without words about the character in terms of her general presentation, the reasons for her insanity and the approach and control for the level of maturity indicated. The presence of the doll encapsulates elements of regression, sexuality and idealization in the depiction of the insane female. Presentation of this coding underscores and provides "evidence" for thematic structures of love/motherhood/sexuality which are given as reasons (on which treatment and cures are based) for insanity regarding the female and her biological definitions and destiny. The repeated choice of the doll image in association with the madwoman's illness in itself automatically operates to place the woman within the female biological and social role at her most regressive and passive (in both childhood and motherhood). More importantly, constant use of the doll's identification with madwomen in film is identification with "the ultimate symbol of powerlessness."[11] Woman as doll represents the culmination of internalization of all the proper feminine traits--a created "idealized" appearance which needs careful maintenance; mute, passive, helpless, easily manipulated and incapable of independent action.

FREUDIAN PATTERNS

Before Sigmund Freud, childhood was defined by psychiatrists and psychologists as an innocent, asexual time. Freud introduced theories of sexuality in early childhood and laid theoretical groundwork for the various traumatic possibilities and problems that might occur in childhood based on sexual awareness and attachments. These traumas would be repressed, only to cause serious repercussions in later adult life. As Freud's subjects were for the most part women, his treatment and subsequent writings focus heavily upon the sexual identity and sexual traumas of the woman, beginning as a child. And Freudian theory of sexuality is based upon female incompleteness:

> Beginning with the theory of penis envy, the definition of the female is negative--what she is is the result of the fact that she is not a male and 'lacks' a penis. Freud

> assumed that the female's discovery of her sex is, in and of itself, a catastrophe of such vast proportions that it haunts a woman all through life and accounts for most aspects of her temperament. His entire psychology of women, from which all modern psychology and psychoanalysis derives heavily, is built upon an original tragic experience--born female.[12]

And Hollywood films, in particular, in their depiction of the symptoms, diagnosis, and treatment of mental illness, adapted the precepts of Freudian psychology as the primary method to approach this subject. This popular culture Freudianism--a simplified and reduced version of psychoanalysis--reproduces many of the main ideas, major positions, and much of the misogyny of Freud. Interpretation of dreams, the psychiatric couch, re-living and exorcising the childhood trauma became central representations of the psychiatric world in early films such as SNAKE PIT, and continued through to modern depictions such as MARNIE and FRANCES. Although much work has been done to refute Freud's work and to critique his ideas and methods, concepts of conformity to prescriptions of gender in analysis and treatment continue to be reflected and projected from the screen. Even when there appears to be surface changes, (psychiatrists generally no longer make overt Freudian pronouncements), at the level of the coded image the covert message concerning her mental condition has not altered.

CHILDHOOD TRAUMA

Unlike her male counterpart in film, the insane female consistently appears childlike in her appearance, behavior patterns and needs. Women are consistently led back to their childhood trauma so that they literally appear as children onscreen, either as grown women re-enacting the scene or through child actresses. For example, the women in MARNIE, FREUD, THE THREE FACES OF EVE, and WHIRLPOOL and many others are specifically led back to the childhood trauma which is depicted as the cause of their problems. They are directed and often forced by a therapist or other male figure operating as therapist to re-enact that time in order to exorcise the block to their "normal" functioning within their cinematic situation. The acquisition of knowledge is not presented as resulting in or necessary for any form of self-fulfillment or understanding, but in the way it affects the woman's ability to function properly, i.e., sexually. The key to the madwoman's problem lies within her awakening from child to woman, i.e., being cured by loving the "right" man. The woman's dependent position, on the husband, is still quite clearly present, however, and still clearly on the level of the child onscreen; but she is presented as cured when she has accepted the proper role for her womanly dependence and performs sexually within the role.

In the film MARNIE, Marnie's problem, as her husband explains it to her mother, is that her "beautiful young daughter can't let any man touch her--any man"--indicating himself, her husband. She has indicated from the beginning of their relationship that she cannot bear to be "handled" by men and never wanted to get married because it was "degrading and humiliating." His response is that she needs to see a psychiatrist and she answers: "Oh, you men--say no thanks to a man and you're a candidate for the funny farm." Since she will not agree to see a psychiatrist, he takes over the role. He does some bedtime reading in Sexual Aberrations in the Criminal Female and conducts a word association session with her. She knows how to play the therapy game—she's "seen all the movies." She can play the game until reference to red (representative of her trauma and adult female sexuality) cause her to break down and ask for his help. The final confrontation at the end of the film between Marnie and her mother literally returns her to her childhood and regresses her grown character to the behavior, attitude and dependency of that child both in literal re-enactment and in such non-verbal indicators as her high childish voice. This film's structure, and many like it, delineates a woman who regresses from a capable self-sufficient person functioning in the world, to a helpless child in actions and relationships. Once she struggles through her childhood trauma and her problem is diagnosed by Mark ("When a child can't get love, it takes what it can get") she is then willing for him to take possession.

The female characters in FREUD, THE THREE FACES OF EVE, WHIRLPOOL as well as SNAKE PIT and others, must deal with a childhood problem, usually by re-living it, that blocks their sexual attachments. The aspect of woman as child is central to diagnosis and treatment. In the cinematic depiction of the development of Freud's theories (FREUD), his primary subject is a beautiful young woman suffering from "hysteria". Her hysterical symptoms in the film are shown to stem from her problems in her relationship with her father, her total dependence upon him, her desire to be all things to him and her traumatic reaction to his brothel visits. Because of this experience she hates men and has become an invalid. Freud is shown in complete control of her mind and body. His control is so total that at one point she is manipulated into telling him what he wants to hear about her early "sexual" experiences. She is led to interpret her dreams about her father in a sexually explicit way, initially indicating that her father molested her as a child. When Freud asks her why she lied, she replies: "Because you wanted me to, I could see it in your eyes." She will do anything he wants or she thinks he wants because she is "pursuing her father" through Freud. He will accept her love until she is ready to make the proper transference to another, as determined by him.

Throughout she is re-enacting her total childhood dependence in her relationship with Freud, and the on-screen use of a doll is the key to her problems. In the flashbacks she is a little child; as an adult she literally cannot walk or see until Freud tells her she can. He feels that this treatment, the re-living of her childhood trauma, has completely cured her case of hysterical paralysis and blindness. The first sign of deeper problems and more profound psychic disturbance is manifested in her enactment of a hysterical pregnancy and childbirth scene. She knits "booties", and goes into "labor" when, according to Freud, "she isn't pregnant, nor could she be," and cradles and cuddles a male doll, a gift from her father. These actions are later interpreted as representative of her relationships with both her father and Freud, those men that she unconsciously wishes to have children with and for; the doll throughout represents her "phantom" child by her father.

LITTLE GIRLS

Thus, many filmic madwomen play with dolls as literal indicators of their level of arrested development; this often functions as part of the total picture of the woman as a child. Woman is often depicted in film as childlike in innocence, vulnerability and dependency. But insane women are often presented as arrested in their development in the literal characters of little girls, with or through the literal objects of childhood, without any control over their lives. If these women are cured, it is again a cure by and for "love," or the possibility of a sexual relationship with the love of the right man. The grotesque permutations of this child-woman presentation in films like WHAT EVER HAPPENED TO BABY JANE? and HUSH, HUSH, SWEET CHARLOTTE are the horrifying result when these women are never cured by the proper love (who has gone away or died or is otherwise unavailable) and thus are never allowed to "grow up". If they try, independently, and on their own, they are met with resistance, and violence often erupts from the venting of a childish rage at being thwarted.

In WHAT EVER HAPPENED TO BABY JANE?, Baby Jane's insanity is represented specifically by a doll, an exact replica of Baby Jane Hudson, with a broken head. During the opening flashback, which establishes Baby Jane's popularity as a child star of the theater and the resulting family frictions, Baby Jane is presented with a "beautiful, gorgeous, lovely" doll of herself. The large doll is brought down the theater aisle after a performance and onto the stage for the presentation to Baby Jane, and presents a mirror image of her as a child. The doll appears literally the same size as the child star. And, as she puts her face next to the doll's perfect likeness, an extreme close up establishes the two as mirror images. Her father's voice-over hawks the dolls to the departing audience as an "exact replica of your own Baby Jane Hudson." The doll appears throughout the film, from the credits through scenes of Jane's comeback attempt. After shots of a car crashing into a gate, the camera holds on a close-up of a broken Baby Jane doll, lying next to the car, with large pieces of the forehead missing. The title then emerges out of the black hole in the middle of the doll's forehead. Shots of the car are intercut with extreme close-ups of the doll's face and finally dissolve into the "blackness" of the hole in the doll's head to tell Jane's story in the "present" time. In the following scene Jane is immediately established as "peculiar" by the comments of the other characters and her appearance. Jane as an aging adult still wears Shirley Temple curls and heavy white make-up like her doll counterpart and plays with her doll. Her peculiarity stems from never being able to completely relinquish that time when Daddy loved her best. Eventually she tries to recapture her childhood by recreating it. But daddy is gone, and there is no man presented to take his place in her life. There is only Blanche to care for, as a result of the car crash.

When Blanche plans to sell the house that Jane believes "Daddy bought for her," Jane tries to preserve this one tangible link to him by resurrecting her child star act in every detail. At one point, she sings, dances and reacts to her "perfect" doll sitting in a chair as her only audience. She believes that the sight of an aging woman singing childish tunes in ruffled pinafore and curls will succeed because "Daddy said you can't lose your talent." As her regression becomes more explicit, she loses all touch with the present and ceases to be able to function. As she plays on the beach beside the dying Blanche the correlation between this madwoman and her doll is complete; she is now also a nonfunctional relic frozen in a helpless, mindless limbo. Because Baby Jane "lost Daddy at an early age," she is seen as crippled in her adjustment to other men and her life. The only other "romantic" encounter, with a sailor, that we are aware of, is presented as traumatic and associated directly with the guilt surrounding the car crash. Thus, as there is no love interest given through which she may establish her identity, her identity is shown as stunted, regressive and finally non-existent.

CONTROL AND POWER

Madwomen depicted as children then supports the need for the control and protection of women as children and consequently supports the presentation of the madwoman as powerless. In a SAFE PLACE the main character, Susan longs for her childhood days when she could "fly." In the final frames, before she "disappears" (or jumps) from her apartment building she is literally presented becoming that little girl again. The image of the adult woman sitting in a bubble bath changes to a small female child blowing bubbles as Susan "flies" away. This child-woman image depicts an explicit connection which supports the "need" for protection and control of both: "Children are probably the group whose oppression and control are most readily justifiable to the majority of society. If women may be shown to be like children (and, in fact, if other oppressed groups can), then their inferior position may be more readily explained to, and accepted by, those who may question it.[13]

Lisa, in the film DAVID AND LISA, appears regressive and childish in her actions (playing hopscotch, rhyming, coloring, running and hiding from problems) and her appearance. As with Baby Jane Hudson and other madwomen like Pinky in 3 WOMEN, she displays her regression through both actions, costumes and use of objects. Pinky wears middy blouses and pigtails and blows bubbles in her Coke although she is a grown woman in her twenties. Lisa is a teen-ager like David, but is dressed in childish smocks and jumpers; one jumper in a checkered pattern has a heart-shaped bodice with straps. David always wears a suit (with coat or sweater), shirt and tie and carries himself very erect and direct in relations with others, particularly the head doctor. Lisa characteristically does not look at others; she looks down or to the side. Often her head is down and her face hidden by her tousled hair as she peeks up from underneath. Her hands or fingers often are at or in or hiding her mouth--a gesture of concealment or "licensed" withdrawal "associated with the young."[14] She relates literally to a statue of mother and child, caressing the statue and crawling into the "mother's" arms. And David is shown throughout in control of her life and treatment. She is powerless in all areas of her life; he is considering a career in psychiatry as a result of working with her and her "case."

In the images even of "rebellious" or violent madwomen, who would seem to present powerful figures onscreen, the symbolic appearance of the doll immediately undercuts her power by placing her nonverbally within her regressive role. During the opening credits of FRANCES, the camera moves in to a close-up of a small mirror in her bedroom. As the camera moves across the mirror, the first figure that appears is the reflection of a doll standing on a shelf to the left of Frances' bed; then Frances appears, presumably a teen-ager, curled up on the bed as she writes her composition on the death of God. Her composition is heard in voice over throughout these opening sequences and represents her first rebellious act, that wins her a prize and recognition, and shocks the community standards. However, her "shocking" words are being read while we watch a small smile and her fingers constantly play around her mouth, her head tilted; and we see cutaway shots to her four other dolls who form her first "audience" for the piece. We see one doll separately, in an extreme close-up of its head, with a seam around the top of the skull where it has obviously been broken or cut and re-glued; a direct foreshadowing of Frances' own condition and final treatment (lobotomy) for her rebellious behavior within this one emblem of childhood. Her behavior throughout the scene, the previously mentioned gestures, as well as the high, hesitating tone to her voice, became associated with this scene of "childhood" and appear throughout the film as part of the portrayal of a grown woman. Though her words and subject matter are serious, the nonverbal presentation of her childishness immediately subverts the strength of her thought and words. This presentation establishes her rebellious behavior as that of a child, not to be taken seriously, even when violent, and as needing help, protection and control even when at her most lucid and strong.

These regressive, childish gestures and association with childish objects continues to characterize and undercut her rebellious words throughout the film when she should appear strong. In her first meeting with the psychiatrist, Frances stands and declares that she will not be what he wants to make her: "dull, average, normal." However, as her words declare her independence, her voice rises higher and higher and softer, becoming finally almost a whisper. As she speaks her head is tilted to the side, causing a sideways glance and she smiles faintly as her fingers play around her mouth in describing his sweaty upper lip. Her accurate verbal description is discomfiting to him, but her actions do not mirror an adult statement, so much as that of a teasing child. Adult statements and actions can eventually be totally absorbed into the image and behavior of a child. In her final appearance before the sanity hearing board, shots of the three panel members are intercut with close-ups of the three dolls of the opening sequence, her first "audience." Her performance is meek, childish and submissive before her judges, and though she jokes in private about her presentation, her overall appearance and more importantly, flashback association with the dolls, belies any strength.

MOTHERHOOD

Madwomen playing with dolls, a grown woman carrying a doll, gives visual indication of her childishness and dependence as well as the source of her problems, both in connections with her childhood, her sexuality and the central biological role of motherhood in the female's mental well-being. And the Freudian psychoanalytic view of pregnancy and childrearing, as it exalted childbirth as the final proof of feminine maturity, also established the foundation of mother love in regression. The bond of mother-child love can be established only through the mother's erasure of her mature self--she regresses to a naturally intuitive, childlike state herself:

> The explanation for this paradox, according to the psychoanalysts, was that only through regression could a woman overcome her childhood penis envy. The regression allowed her to unconsciously accept the baby as the symbolic 'gift' of a penis, compensating for her own long-resented 'castration.' Conciliated at last, the woman is able to accept her femininity and submit without envy to her husband's love.[15]

The woman was thus encouraged to exist on the same level of dependency, immaturity and inability as her children. According to the psychoanalysts she could be expected to regress to "a psychological replay of her own infancy by the experience of motherhood,"[16] and would thus respond readily as the obedient child to the authorities, i.e., doctors, experts, husbands and other father figures in her life.

Such regression and identification of madwomen in film as childlike has already been pointed out in discussion of the use of the doll image among other nonverbal messages to depict arrested sexual development, its causes, treatment and cures, as well as underlying power structures. The use of the doll icon also serves to locate the madwoman within the biological role and determinants of motherhood as encoding the Freudian tenets stressing the role's central importance while also establishing its basis in regression and loss of self. The doll is a prized possession among the inmates in depictions of asylums in many films such as SNAKE PIT and SUDDENLY, LAST SUMMER. In the opening sequence of SUDDENLY, LAST SUMMER, the camera tracks through an open female ward and stops on one inmate, standing in the foreground on screen right in a medium close-up. Smiling, she rocks and cradles a doll to her breast, and slowly lifts it the length of her arms up into an area of light, apparently coming from high windows. As a nurse approaches her, she again cradles the doll, then clutches it to her chest so that it won't be taken away. The nurse leads her away, and the scene immediately cuts to a close-up of the inmate's reclining face, head bandaged. As she's wheeled to surgery for a lobotomy, the camera follows the stretcher as it goes through the door. The door closes, revealing the doll sitting next to the patient's purse on a small table that had been hidden behind the open door. The doll appears in close-up in a square of light, with shadows of wire mesh crisscrossing its form. The importance of the doll and its implications have been so clearly established throughout the filmic presentation of the character of the madwoman that it has become a form of shorthand--this entire opening sequence appears without any dialogue or word of explanation.

SNAKE PIT

In SNAKE PIT, even though the main character, Virginia, trades cigarettes for the doll, there is still a heated dispute as to ownership. As Virginia cradles the doll in her arms, her doctor asks if she's "a good mother." In the ensuing exchange she responds at one point that: "Every woman wants a baby," and the doctor immediately begins questioning her about her own feelings about motherhood. During this discussion her feelings and wishes are related to childhood feelings regarding her father's death, and the guilt she carries in relation to it. The doctor states that her problems started because she didn't get enough love from her mother as a baby so she turned to her father for that affection. When Virginia's father took her mother's part (her mother was feeling unwell as the result of another pregnancy and Virginia made her "nervous"), Virginia began to harbor unconscious resentments that made her feel very guilty when her father died. Then she turned to a father substitute in her only boyfriend, who provided the love and protection of a father figure--someone to take care of her and make her "feel like a child again." The doctor explains at length that the key to solving her problem lies in her understanding and accepting that "husbands and fathers aren't the same thing." She must learn that women grow up and marry and transfer their love from the male figure of the father to the husband. But they also must accept and reciprocate the "different" love within marriage--the sexual love with a husband and the responsibilities of motherhood.

However, the treatment and determination of the madwoman's cure is not shown to rest upon growth and maturity in the prescription of marriage with the right man and motherhood. Virginia replies that she feels the knowledge of this transference in her heart, i.e., emotionally, now, but doesn't understand it; the doctor indicates that understanding will come in time. However, she is shown working through this process on an emotional level, an immature level, throughout. The problems are presented as emotional as are the solutions. She makes a transfer of emotional attachment to Dr. Kik, the parental figure who takes care of her at the hospital and is in complete control of her life within the institution and then to acceptance of her role with Robert. As she leaves the asylum, the transference is made complete and concrete. She tells Dr. Kik: "I knew I was getting well--I'm not in love with you any more." Then, stepping outside the asylum door, she asks Robert for her wedding ring and asks him to place it on her finger once again. She is never without the controlling guidance of a dominant male father figure. And her acceptance of that control over her life results from love, of the "right" man and their future children, stressing her vulnerability and lack of intellectual identity in and of herself. Her identity must be established from without by the proper connection with man within the proper role, rather than developed from within. Then she will know who she is--because there will always be someone (male) there to tell her. Thus the ideal prize, maturity through husband and family, is expressed in individual self-negation and external control.

RAINTREE COUNTY

The representation of Susannah in RAINTREE COUNTY is associated with her collection of dolls, the most pivotal to her mental health being a partially burned doll directly linked with her childhood trauma and her impending motherhood. On her honeymoon she introduces them to her husband by putting them all on the bed and announcing that they "go everywhere" with her; and the burned doll is central in re-living the childhood trauma. The collection literally lays on the marital bed until her husband Johnny complains about a lack of "privacy." The collection is removed temporarily from the bed, but once she becomes pregnant she is shown in bed literally sleeping alone with Jamie, the burned doll, and the other dolls hang across the top of the bed's headboard. And, in the depiction of the stresses of pregnancy, she immediately begins to sleepwalk and search for a lost doll. After the birth of her son, and as the child grows, she regresses to the time of her childhood trauma and reacts with paranoia to everyday occurrences. Her final act is to confide in her son that she's "going to do something for Daddy." Then she gathers up her doll to take with her into the swamps, where her drowned body is found the next day. In her final moments onscreen, Susannah lies face down in the swamp. Johnny gently turns her over and the camera cuts from her still form to a close-up of Jamie floating in the swamp next to her body. Her regression leads finally back to complete erasure of self, common in the depiction of this character.

Madwomen in film are shown regressing in motherhood and childhood and throughout presentation of the character. Powerless, they regress until their selves disappear, until they literally no longer exist. Madwomen consistently attempt suicide (3 WOMEN, I NEVER PROMISED YOU A ROSE GARDEN, THE THREE FACES OF EVE, MARNIE, SUDDENLY, LAST SUMMER, FREUD, THE BELL JAR, SPLENDOR IN THE GRASS, FATAL ATTRACTION, etc.) or commit suicide (RAINTREE COUNTY, THE BELL

JAR, THE MIRROR CRACK'D ORDINARY PEOPLE, etc.) Within the presentation of "acceptable" behavior and goals and the imminent threat of force, authority and control the madwoman is shown most often negating herself in actions, words and the nonverbal elements of her presentation including the consistent thread of the doll icon associated with this character. The madwoman is shown carrying her conditioning to its logical conclusion within filmic coding boundaries. Presumably it is an insane conclusion: but it is the one most often depicted and reinforced in its depiction. Presentations of alternative reactions are therefore not generally available. Although the cases are purportedly individual, the symptoms are role-reinforcing.

NOTES

[1] Julia Lesage, "S/Z and RULES OF THE GAME," Jump Cut, No. 12/13 (December 30, 1976), p. 45.

[2] Lesage, p. 45.

[3] Lesage, p. 49.

[4] Nancy Henley, Body Politics (Englewood Cliffs, New Jersey: Prentice-Hall, 1977), p. 3.

[5] Henley, p. 5

[6] Brian Sutton-Smith, Toys as Culture (New York: Gardner Press, 1986), p. 12.

[7] Sutton-Smith, p. 259.

[8] Sutton-Smith, p. 223.

[9] Sutton-Smith, p. 226.

[10] Sutton-Smith, p. 239.

[11] Janet Sternburg, "Revealing Herself," Film Library Quarterly, 5, No. 1 (Winter, 1971-72), p. 11.

[12] Kate Millett, Sexual Politics (New York: Avon, 1969), p. 244.

[13] Henley, p. 193.

[14] Ervin Goffmann, Gender Advertisements (New York: Harper and Row, 1976), p. 57.

[15] Barbara Ehrenreich and Deidre English, For Her Own Good (New York: Doubleday, 1978), p. 201.

[16] Ehrenreich and English, p. 202.

Visual Thinking How Do We Define, Identify and Facilitate It?

Deborah Curtiss

Visual thinking seems to be a term and concept used almost casually, with an assumption that its meaning is generally known and agreed upon. Yet, like all thinking, it is profoundly complex, and in many ways, indefinable. As a visual artist who attempts to remain abreast of theory, I discern a discrepancy between what I experience and the descriptions and definitions that I read. As a result, I have begun a search of the literature on the topic to explore whether there are individuals who have written convincingly about visual thinking as I know it, and/or to see whether I have a different perspective that I may, at some future time, attempt to articulate verbally. To that end, my presentation reflects a tentative and incipient approach to the topic. As such, it is in three parts.

I. Solicitation of definitions and discussion of visual thinking.

My own definition of visual thinking is based upon experience in creating visual statements (drawings and paintings). It entails the mental activity, conscious or otherwise, when we receive, alter, and create visual statements, during which we use our assimilated visual acumen and intelligence to spontaneously respond to visual phenomena in ways that are direct, and free from extraneous theory and preconceived notions.

The source of visual phenomena may be extraneous: consensual reality, visuals; or internal: visualizations.

ALIS 26x60" acrylic and graphite on unprimed linen canvas, From Chrysalis Series © 1990, Deborah Curtiss

As an artist, by combining materials and techniques, I continually provide extraneous visual happenings with which I engage in an evolving and spontaneous dialogue that eventuates in a visual statement (painting). As an integral part of the process, I may conjure visualizations to conjecture the outcome of a range of possibilities and, in response to those envisioned possibilities, make material and technical decisions to affect the outcome.

One participant at the IVLA conference session introduced the concept of tacit knowledge, which I recognize is also an integral part of my creating/visual thinking process. Study of the relationship among the elements, principles, styles and techniques of visual expression is so thorough, and by now ongoing for over thirty years, that I draw upon a vast visual reservoir without forethought, and rarely afterthought.

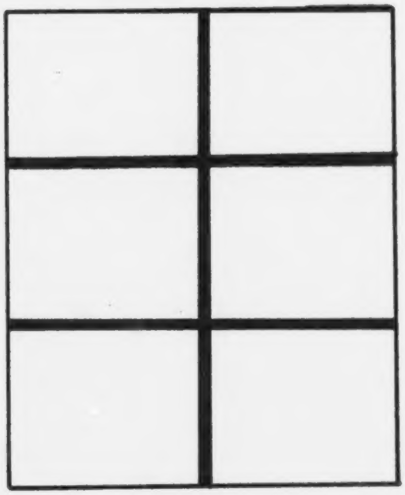
Yet, without such training or persuasion, I think all individuals can and do effortlessly engage in visual thinking that is qualitatively similar to that which I employ.

II. An experiential opportunity to clarify visual thinking.

To enable others to discover what I mean, I present an exercise that I have found effective in demonstrating pure visual thinking. It is a basic design problem that anyone can do: apply three pieces of 1/2 inch black tape (cut in 18 inch strips) on a 14 by 17 inch piece of paper so that they are parallel to the edges of the paper and extend from one edge to the other. Put one tape strip in one direction, and two in the other. (The problem is simple and the rules strict for reasons that will become obvious.)

When the participants finish this assigned task, I ask them to write on the back of the paper how they chose to place the tape strips. They then are asked to put their solutions up on the wall (in a visually literate manner) for discussion.

Selecting several, I ask participants to describe how they came to place the tape. Almost everyone relied upon decision-making processes that were extraneous to visual thinking. These included *associations*, such as making a "Mondrian" or a landscape with a horizon;



An "associative" solution: window panes.

theories, such as "proper" proportions or ideal balance; and *being creative*, such as trying to do something different, unusual, or unexpected.

What appeared to be a simple problem began to emerge as one that is as complex as it is subtle.

Faced with a blank piece of paper, where to put the first piece of tape engages a number of options. Is the paper oriented horizontally or vertically? If vertical, is the first tape horizontal or vertical? If horizontal, how far from the top and bottom?

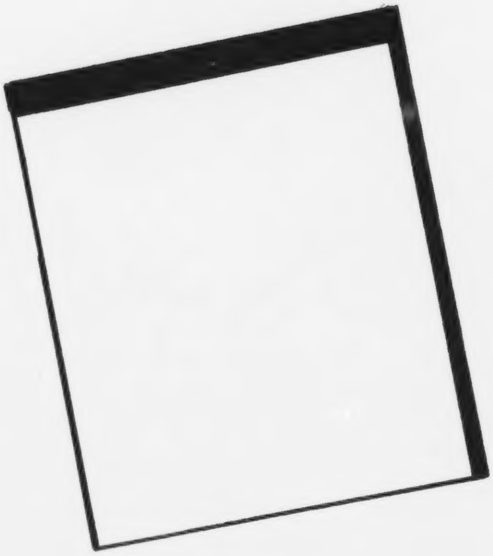
How are those decisions made? To make them *visually*, in purely visual terms, one eschews associations, theory, and creativity, and engages in a visual dialogue with the paper, tape and one's intelligence and preference. We place the paper in the orientation that is consonant with our being at the moment. Holding one piece of extended tape over the paper, we watch as we move it slowly from side to side and back and forth between top and bottom, until we discover a place it seems to belong. The tape rests where it arrests our eye.

Once placed in that position, we again look at the paper and decide whether to retain its orientation or turn it in another direction. Finding the consonant orientation, we take the second tape, and likewise slide it up and down and back and forth until it finds its place relative to both the paper and to the first tape, to which it may be perpendicular or parallel.

Again, we assess the orientation, and change it if desired. Then we introduce the third piece of tape. If the first two are parallel, then it is perpendicular. It is placed according to visual feedback to satisfy one's eye in purely visuo-spatial terms. If the first two tapes are perpendicular, then the third will be parallel to only one of them. Which one, and where?

Then a final assessment as to orientation, and presentation of the "design" in that orientation for all to see.

Typically, a person who did this exercise for the first time, and in a manner similar to that described above, will be stymied by the request to write down the process, and when asked to describe it orally, may feel terribly inarticulate and say something like, "I don't know, I just did it." With coaxing, they may say, "Gee, I don't know, I just kind of liked it that way." By contrast, those who rely upon extraneous ideas will readily verbalize their process: "I wanted to make it look like windowpanes," or "I thought putting the tape at the edge of the paper would be far-out, art's about creativity, isn't it?"



A "creative" solution.

Who said anything about the exercise having to do with art? Unfortunately, we often become self-conscious about visual problem solving, as if it is something that calls for cleverness. Yet, every day we make a myriad of visual decisions based solely upon visual cues. If we don't rarify them by associating them with art, we tend to take them for granted, dismiss them as an unimportant part of our functioning in the world. A middleground approach between pretense and neglect is to bring visual thinking to awareness and integrate it into our lives. Doing so can increase viewing ability and empower thinking flexibility and options.

There is an esthetic component to this exercise, based as it is upon spatial relationships that are chosen according to personal preference and satisfaction. To some extent such preferences may be culturally, archetypically, or personally determined, but the source is unimportant for the success of the exercise. One could do the above exercise every day for the rest of one's life, and each day arrange the tapes differently according to the visual responses one has at the moment. The challenge would be to retain spontaneity and purity of visual responsiveness.

By magnifying and spotlighting a process of visual decision-making, we come to realize that what seemed simple is actually deceptively complex, but no matter how complex, the process is simply an integral part of our daily experience.

III. Presentation of a bibliography with an invitation to others to contribute.

Contributions from Elizabeth L. Haslam, Ph.D., an instructional designer with the Strategic Management Group, Inc., Philadelphia, and Dennis Pett, a founding member of the IVLA and audio/visual specialist long associated with Indiana University, are acknowledged.

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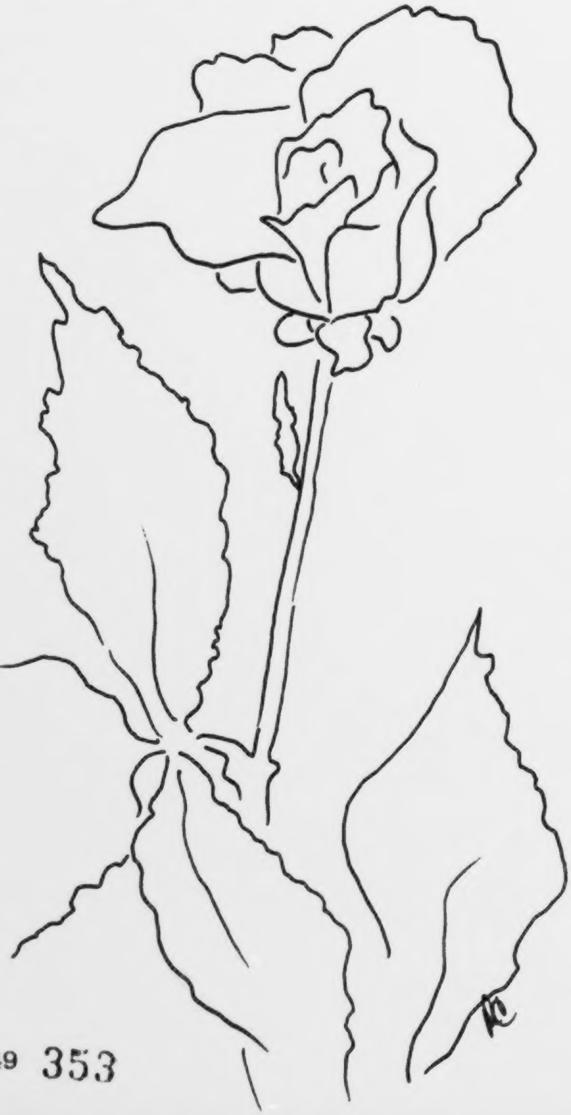

Image Manipulation: Or The Zelig Phenomenon

Ann Zelle
Ron Sutton

INTRODUCTION

What follows is our attempt to track and explicate the "Zelig Phenonmenon" in still and motion photography. We have subtitled our paper/presentation on image manipulation **The Zelig Phenomenon** in recognition of the film made by Woody Allen in 1983 that sums up both the fun and danger that resides in this area of technological advance-ment. A careful look at its 79 quixotic minutes will reveal deliberate and effective manipulation of both still and motion imagery to create a satirical spoof of American culture and its media.

STILL PHOTOGRAPHY AS TRUTH

Since its presentation to the world in 1839, photography has been credited with the power and charged with the responsibility of being true, an accurate record of the real world. It has been a mainstay of documentary proof in the fields of law, science, and socio-political action. As Metropolitan Museum Art Curator William M. Ivins has written, "The 19th century began by believing that what was reasonable was true, and it would end up by believing that what it saw a photograph of was true." (Grundberg, p. 29)

Ironically, since the beginning, photographic images have been manipulated in the shooting, printing, and reproduction stages for a variety of motives. The first was undoubtedly a need to compensate for the limitations of photographic materials. Early photographic plates, exposed in the camera, were very slow and insensitive to light, necessitating uncomfortably long poses. The faces of portrait subjects were covered with white powder to better reflect light in an effort to shorten exposure time. Retouching of negative and print with brush and ink was used to correct image and subject flaws as well as to add detail. Single prints made from several different negatives solved the problem of the limited exposure range of glass plate negatives. This glass plate technology of the second half of the 19th Century had a limited exposure range, and could not simultaneously record the dark detail of landscape foreground as well as the tone and clouds of the bright sky. This was handled by painting in detail on the print, or exposing two separate plates and then printing each half on a single piece of printing paper.

This process of multiple printing inspired artists such as Oscar G. Rejlander and Henry Peach Robinson to produce totally fabricated single images made from parts of as many as twenty different negatives. In printing, each part of the picture area was exposed separately; the rest of the paper was blocked from receiving light by elaborate masking techniques. Queen Victoria's interest in these combination prints gave them legitimacy and great popularity. Studio and darkroom sleight of hand abounded. By the end of the century a reaction against these manipulations coincided with efforts by Alfred Stieglitz and others to define photography as an art in itself, no longer dependent on the tradition of painting for its aesthetics and values. The The 20th century concept of "straight" photography, real and unmanipulated, grew out of this movement and gave us the work of photographers such as Ansel Adams and Edward Weston.

A second motive for the manipulation of photographs was the desire to edit subject and image to exaggerate a particular viewpoint. Writer James Agee, who collaborated with photographer Walker Evans in the 1930's, wrote:

> It is doubtful whether most people realize how extraordinarily slippery a liar the camera is. The camera is just a machine, which records with impressive and, as a rule, very cruel faithfulness, precisely what is in the eye, mind, spirit, and skill of its operators to make it record. (Rosler, Pg.7; Orig. Dec. 23, 1966, Life,.)

Edward Curtis, whose turn-of-the-century documentary project on American Indians was presented as twenty volumes of ethnographic record, in fact dressed his subjects with unauthentic props and costumes and retouched to remove what he considered un-Indian characteristics, all in the service of his thesis that the Indian was a noble and idyllic vanishing race (Rosenblum, pp. 178, 324-5).

It was not until the 20th century that manipulation of photographs for political propaganda reached its apex. Examples have been documented by Alain Jaubert in his 1986 book Making People Disappear (published in English in 1989). Jaubert categorizes photographic manipulations by process:

1. Retouching - Using a brush and ink to remove:
   - dust spots or damage to negative or print.
   - distracting background or detail (telephone wires appearing to skewer the subject's head).
   - distortions caused by camera perspective and optics.

Photographic portraits have often been made with soft-focus lenses or retouching to remove cosmetic imperfections such as wrinkles and moles. In 20th century official portraits of Soviet and Chinese politicians this practice has been carried to the extreme. Photographs of Communist leaders in their 70's or 80's show smooth, young faces which are recognizable but are without texture or reality.

2. Blocking - Painting out the background to divorce figures from the original site of the photograph, or eliminating background and figures in order to "unrecord" an event or idealize a figure by isolating it from commonplace people or places.

3. Cutouts - Cutting a figure out from the background and placing it into a new setting or group. Collage is made by pasting together a number of separate image parts; a Photomontage is made by

rephotographing and printing the collage in a seamless copy. Great skill is needed to make a convincing photomontage in which shadows are cast by a common light source, the contrast and exposure of the parts are compatible, and the figures appear to be inhabiting the same space at the same time.

4. Recentering - Changing the cropping or framing of a picture to exclude unwanted figures or information at the sides or edges.

5. Effacement - Slicing a figure or area out of the center of a picture, joining the edges, and retouching to smooth the seam or fill in the blank. A well-known example, because it was so widely observed and recorded, is the elimination of Czech leader Alexander Dubcek from a group picture taken in front of the Saint Vitus Church in the Prague Spring of 1968. By 1969, he had been cut out of the official picture, and the background space was adjusted by the shifting of a house to cover part of the church facade. In the doctored version, the tip of Dubcek's shoe remains.

In some cases, the space left by effaced figures is left blank as a warning statement in itself, as in the Chinese pictures from which the denounced "Gang of Four" were effaced after Mao's death (Jaubert, pp. 9-14).

Most of Jaubert's examples are drawn from totalitarian societies: Russia, China, Nazi Germany. Toward the end of his book he includes some examples from democratic countries. The British press faked war scenes, such as "The taking of Tobruk, October 1942" by staging them several days after the event and recreating the ambience with smoke bombs. Other writers have documented American manipulation of wartime imagery for propaganda purposes. The difference in a "free news" society is that the instances are less numerous and more difficult to achieve, due to the existence of more independent observers and recorders able and ready to challenge a faked record.

Witness the case of the 1982 publication in the French magazine Figaro of a photograph of burning bodies. The label said it was the bodies of Miskito Indians killed in a Sandinista massacre. The photographer who had taken the picture denounced the magazine for mislabelling the image and recentering it to eliminate French Red Cross workers from the scene. In fact, the picture had been taken two years earlier, and the subjects were not Miskito Indians. They were partisans from both sides killed at an anti-Somoza demonstration. The bodies were being burned for health reasons. The photographer sued the magazine and won (Jaubert, pg. 184-5). Martha Rosler, in her excellent article on "Image Simulations: Computer Manipulations, Some Considerations" in Afterimage, reports that Ronald Reagan's Secretary of State, Alexander Haig, got into hot water by waving this picture (or one similar to it) aloft "citing it as evidence of Sandinista brutality...The image was meant to be decisive in rallying support for our still-secret war in Nicaragua." (Rosler, p. 9)

In commercial art and advertising, image manipulation has been accepted practice as long as it did not misrepresent the facts. (Do blonds have more fun? Will Retin-A really make me look twenty again?) In the popular (some might say vulgar) press, Playboy airbrushes its nudes to plastic perfection, and the National Enquirer regularly puts together in photographs pairs of movie stars who have never even met. However, the public would probably be appropriately shocked to learn that the cover of TV Guide for Aug. 21-September 6, 1989 used the cut and blend technique to fuse the head of Oprah Winfrey to actress Ann-Margaret's body. An alert designer of the dress spotted his creation on the wrong person and Ann Margaret's husband identified her ring on the "body's" finger. The Guide editor said he had spoken to the illustrator and it wouldn't happen again!?! (Rosler, pg. 10)

Serious journalism, however, is another case altogether. American mass culture still demands (and therefore seems to have faith in) truth in journalism. There has been an assumption that photographs printed in the legitimate press are governed by rule and tradition to be real, straight, and true. The journalism profession itself has guaranteed veracity. With admitted exceptions, most of which get exposed sooner or later in a "Freedom of Information" society, the press does not tamper with editorial images.

Alas, with the advent of computer image production, manipulations are no longer detectable, and editorial images are no longer necessarily true. Perhaps they never were in an absolute sense. W. Eugene Smith, the mentor and conscience of photo-journalism, is now known to have improved the image and filled in a fogged corner in his well-known portrait of Dr. Albert Schweitzer, by printing in elements from a second negative. Robert Capa's 1936 Spanish Civil War Soldier, photographed in mid-fall backwards at the "moment of death," allegedly shows up alive again in a later frame on the contact sheet (Grundberg, p. 29 and Knightly, p. 209-212). Newspapers have long airbrushed out distracting backgrounds in photos and flopped negatives (printed them in reverse) to fit page layouts. But these practices are different from the new breed of manipulation made possible by computer imaging.

Recent examples in the legitimate press include the February 1982 cover of National Geographic in which two pyramids have been pushed closer together than they were on the negative; the cowboy and horse which were moved closer to the tree on the cover of A Day in the Life of America; and the stars of Rain Man, who were photographed separately and then presented together on the cover of Newsweek. These manipulations were made to improve composition or meet publishing convenience. What harm does it do? Nothing in itself, certainly, but it calls into question the truth and credibility of all editorial images -- today the pyramids, tomorrow Roseanne Barr having lunch with Barbara Bush! (Grundberg, pg. 29)

Questions of copyright, liability, rules of evidence, and appropriation arise with this new technology. Under the 1978 Copyright Act, photographers automatically own rights to their photographs unless they sign work-for-hire agreements with employers. Who owns the rights to an image that has been fed into a computer, cropped, colorized, manipulated, and combined with the work of others? Who gets paid? Who can resell the work through stock agencies?

While digital (numerical) information does not change with time the way analog (physical/film and paper) information does, computer images have no original, permanent record (print or negative) to serve as documentary proof. Once the image is recorded on a magnetic storage disc (which can be reused or erased), it is impossible to tell if the image is camera-direct or computer-enhanced. There is no original and therefore no record by which to judge whether the image was altered in transmission by the electronic camera operator.

On the question of appropriation, documentary photographer Susan Meiselas writes:

As many of my images from Nicaragua have come to have lives of their own, I have tried to record their history. A picture of a Sandanista guerrilla throwing a molotov cocktail taken in 1979 was used years later as a cover for a revolutionary Christian magazine. Then it was photocopied and mailed to me from a post office in Washington D.C. to raise funds for the Contras. It was used again in Nicaragua, along with the slogan No Pasaran, as a symbol to organize the militia to fight. Finally, without any text, it was stenciled on walls in Nicaragua. Other images have been reappropriated in Nicaragua and made into stamps, straw rugs, matchboxes and record covers (Meiselas, p. 13).

While Journalists fume, artists have been fiddling. Art and advertising have always referenced previous imagery, but photographers of the 80's have taken this a step further by recycling pre-existing photos and integrating them into new work. Sherrie Levine "reshoots" famous images of the past (such as Walker Evans' depression era sharecroppers), calls them "fakes," and then makes only one copy so that they are "unique images." Boston's Starne Twins have photographed older works of art, blown up the images, cut them into pieces, and scotch-taped the collages to gallery walls.

Other artists, such as Cindy Sherman and Nic Nicosea, photograph what look like stage sets with actors, fabricating images rather than recording the existing world. Photographic art work is now exhibited and sold at art prices previously reserved for the "high art" of painting. Old lines between painting and photography have been crossed and, perhaps, permanently obscured.

These new directions call into question the issues of attribution, copyright, the traditional "straight" aesthetic of Stieglitz and Adams, and the ideal of photography as the documentary art of the real. Documentary work continues to be done, but is it journalism, or is it art? And which rules apply? Studio images by artists such as Mapplethorpe have generated controversy as to what is appropriate, if not legal, for artists to document.

MOTION FILM AND ITS LEGACY OF MANIPULATION

Almost from its invention in 1895, motion film was involved in trickery and manipulation. George Melies discovered, quite accidently, that if you stopped and then started the camera again, amazing things would appear to happen. With the camera on a tripod, you could have someone strike a person with a wand, then have the person leave the scene, start the camera again, and poof, the person appeared on film to have disappeared. Add some smoke and you have successfully created an illusion that magicians of the day would have killed for to execute so simply and easily. (Barnouw, p. 98)

Special effects magic is well-known. Raymond Fielding has illustrated many of these in his The Techniques of Special Effects Cinematography: for example the use of mirrors to create the illusion of a ghostly figure moving across a room; or rear screen projection which portrays chracters acting in front of all sorts of foreign and even fantastic natural settings; or matte painting on glass wherein whole towns and landscapes can be created in the background and then combined with the actors work on a sound stage through the magic of rephotography; or miniatures, exhibiting the effect of scale distortion, used so effectively in films such as King Kong.

Less well-known are the panoply of tricks used by professional filmmaker to create the illusion of continuous action or to mask reenactment of scenes for the camera. The match cut, the cut away, and the insert all function to make the narrative fiction film flow easily and smoothly to our eye as if we were omnipotent observers of action. (Cheshire, p.80) For example, two women stand in a room around a table. We see them in mid-shot. They argue and then one lunges toward the table. We see a close-up of an ornate letter-opener. In the next shot we return to the master shot and watch as the protagonist picks up the knife. An insert shows us the horrified look on the face of the woman about to be attacked. The master shot reveals the attacking woman advancing to stab her opponent. The knife begins to descend, then suddenly we see it continue toward the second woman in a closer shot, and finally we discretely witness the final plunge of the knife into her chest from a reverse angle shot from behind the victim, similar in size and distance to the master shot. Members of the audience take all this for granted, having watched thousands upon thousands of such scenes during their lifetime. Only students learning to create such professional footage realize how complicated the process is and how many times the professional actors must repeat the action. It looks like a one-time happening, but the visually literate eye spots it immediately for a fictional event, repeated for the camera's pleasure, and the audience's satisfaction.

What many people do not realize is that such techniques were used in all types of films, including documentaries in the pre-1960 period. From Nanook of the North to The Quiet One by Sidney Myers, fiction film techniques were necessary even when one's subject was actual rather than fictional material. The techniques have returned in such modern post-cinema verite films as The Thin Blue Line and Asylum.

A basic book in film study, such as Louis Giannetti's Understanding Movies, will help the student and layperson gain an awareness of this phenomenon documented in past presentations at previous IVLA Conferences (Sutton, JVVL, 1981; 1984). Not everyone acquires filmic visual literacy simply by watching. However, with a minimum of instruction, awareness dawns and critical understanding of the process begins.

NEW TRICKS WITH STILL AND MOTION FILM

Our purpose has been to review the past, clearly intent on demolishing the force of Andy Grundberg's lead sentence in his August 12, 1990 article in the New York Times wherein he stated, "Ever since its invention a shade more than 150 years ago, photography has been seen as a medium of truth and unassailable accuracy." We do not quarrel with the fact that this is the way in which photography, both still and motion, has been seen, just that the vision has been myopic! Grundberg uses the Oliver Wendell Holmes quotation that a photograph serves as a "mirror with a memory." We hope that we have demonstrated that the mirror is always cracked and that the memory is faulty and selective, a construct of whoever holds the mirror.

We know this because we have studied the mediums of photography and film both as historical artifact, and current profession. But we enter now the new age of the computer and an entirely different set of circumstances apply.

THE NEW AGE OF COMPUTER ART AND ARTIFICE

All of this sets the stage for computer art, in which newly made or appropriated older images are fed into a machine and enlarged, reduced, cropped, re-colored, re-drawn, intensified, and combined with other images. Artists, as is their wont,are embracing the new medium of image creation, not to mention the delicious exercise of flying in the face of tradition.

The work of New York artist Nancy Burson illustrates the new possibilities of computer art. Burson works with a computer programmer to feed a number of images (usually head shots) into the computer and have them superimposed on each other in varying percentages. The resulting composite images, such as "Lion and Lamb," have a fascinating strangeness to them that at once makes you laugh and makes you think. Many of her composites have a political message, such as her blending of races in their exact percentages (57% Oriental; 7% Black; 36% White) to produce the image "Mankind." Her "Big Brother" was used as a background for Walter Cronkite in a television program about George Orwell's 1984. Burson's system of aging people by computer has been used to update photographs of missing children over the years.

HOW DOES PHOTOGRAPHIC DIGITIZATION WORK?

To manipulate computer imagery the original photograph is digitalized, scanned by machine and broken down into tiny picture elements called PIXELS. Each pixel is analyzed for information (shape, color, brightness, etc.) and assigned a numerical code. At this point the computer operator can make a number of changes before storing the final image on a magnetic disk:

- do normal retouching of spots and scratches
- brighten or change the color.
- add new parts to the picture - move or eliminate old parts.
- extend backgrounds to fit page formats, to surround new imagery, or to fill in holes where part of the image has been removed.
- draw in shadows to make a common light source direction.
- use controls to draw "freehand" on the image.
- turn images in perspective or cast them in 3 dimensions .

The advantage of this system over traditional retouching and manipulation of images is that the operator can see the changes immediately without waiting for film processing or printing. It is also more accurate, as any pixel can be enlarged for retouching, and then reduced again to size.

The list of possibilities depends on the sophistication (and price) of the computer. NASA uses computers to clarify space images by sharpening them or adding color to help separate areas. Flight training for pilots and astronauts uses computer-generated visual simulations of flight conditions; simplified versions of this system may be found in the familiar Video Arcade electronic games.

At the high end of the equipment range are the super electronic imaging systems such as Scitex, Hell, and Crosfield, now used by major news publications for pre-press production. Rosler relates the story of the Orange County Register wherein an engraver routinely "dialed in" the color blue for a swimming pool picture without knowing that the picture was to illustrate a story about vandals dyeing the water of the pool red! Inadvertent and technical, she still points out that "it's just the kind of egregious error that makes photographers and ethicists wince" (Rosler, pg. 2).

Black and white images can be manipulated on the Apple Macintosh personal computer. Photoshop is a Macintosh program for tabletop publishing and image design in color. The October 1990 cover of Pre--- The magazine for the Prepress Industry, was created on Macintosh Photoshop, from a single photo model shot against a white background.

The 35mm transparency was scanned on a Leaf scanner and opened in Photoshop where [designer Nick Fain] added digital makeup and changed the model's eye color. The background was added by using the gradient fill tool and creating a linear blend between two shades of blue. Next, the image was duplicated and resized to create a miniature version of the original. The reduced copy was repeatedly pasted into the full-sized version. The rotate and perspective commands were used to change the appearance and orientation of the copies. The copies were made semitransparent by using Photoshop's paste controls to vary their opacity....The final image was color-separated within Photoshop and saved in Scitex CT format (Guttman, pg. 48). All of this on a computer now used in many gradeschools!

Other hardware includes the recording device itself: the electronic or still video cameras being marketed by Sony and Canon record the image on a light-sensitive silicone pad or sensor, which breaks down the image into pixels, assigns them code numbers and couples with a digital storage disk where the information is stored. Eastman Kodak will also market a digital camera, but in the meantime it is challenging the Japanese electronic camera with a system that can take traditional silver-based photographic images and translate them into digital data which can be manipulated and fed into a desktop publishing system. The advantage? Higher quality (more information bits stored) on a silver negative than on a disk, and no new camera is needed (Holusha, pg. 11).

The advantage of the video still camera is that images can be viewed quickly and easily without needing a darkroom, and they can be transmitted to newspapers immediately by sending their electronic signals over telephone lines. Still video images of the recent Olympic games and presidential elections were sent by phone to newspapers and magazines on tight deadlines.

Technology is still developing. Computer image manipulation is not yet as easy as retouching and copying an existing photograph. Visual information has to be translated mathematically by the computer, and sophisticated programs are required to build realistic images. Whatever the form or format, visual images are here to stay, and it is only their role that is in question. Photo critic Andy Grundberg writes,

> In the future, it seems almost certain, photographs will appear less like facts and more like factoids -- as a kind of unsettled and unsettling hybrid imagery based not so much on observable reality and actual events as on the imagination. This shift, which , to a large extent has already occurred within the rarified precincts of the art world, will funda-mentally alter not only conventional ideas about the nature of photography but also many cherished conceptions about reality itself (Grundberg, pg. 29).

In 1932, the visionary photographer Laslo Moholy-Nagy predicted that the illiterate of the future would be equally ignorant of pen **and** camera. It would seem that the visual illiterati of our future will not comprehend computer imaging.

THE ZELIG PHENOMENON IN FILM

> Zelig (1983) is a movie of filmclips and photographic stills (virtually an entire movie in the style of Citizen Kane's newsreel)--an ironic examination of the way American hype converts anonymous non-entities into media superstars. (Mast, p. 433)

This is the entire comment on the film in an academically popular history of film. For any who have not seen it, Woody Allen plays the title role of a man, Leonard Zelig, who became famous for his chameleonlike properties in the 1920's. Wanting desperately to be liked, and having few distinguishing characteristics of his own, Zelig took on the traits, mental, emotional, and physical, of anyone near him. The film treats him in Citizen Kane newsreel style as a real historical personage. Much footage of him from the 1920's is interspersed with contemporary comment on him as a phenomenon.

It is clear in studying articles quoting Zelig's editor, Susan E. Morse, and camerman, Gordon Willis, that Woody Allen did not have the wondrous new computer graphic equipment at his disposal when he produced Zelig for a modest 6 million dollars. (Maslin, pg. C 11; Bogre, p.43-48)

As Willis describes it, vast quantities of stock footage were collected and studied carefully. Then, in 12 weeks, Woody Allen and Mia Farrow were photographed painstakingly in situations, sets, lighting arrangements, and with special fifty- year-old lenses, so the new footage could be intercut with the old footage and few would be able to notice the difference. There are two traveling matte shots (special effects involving rephotography) in the film which Willis refuses to identify. One seems certainly to be the moving image of Zelig in the on-deck circle between Babe Ruth and Lou Gehrig of the 1920 New York Yankees.

Enormous patience and care went into the making of this spoof of American society and media. Willis was nominated for an Academy Award in cinematography for his work. The results are outstanding, as home movie re-creations are blended with home movies of the time, newsreels are intercut with the narrative footage of the Zelig story, and thousands of film clips and stills are laid against the Dick Hyman score that knits it all together. The in-color, straight documentary interviews with contemporary "experts" such as Susan Sontag, Saul Bellow, and the late Bruno Bettleheim add wonderful spice to the satirical brew.

The problems in deciphering and breaking the almost seamless codes used in the Allen film are difficult even for those of us trained in visual literacy. They may prove overwhelming for the unintiated. And it was for that reason we used "The Zelig Phenonmenon" as the subtitle of this paper.

In the past, image manipulators usually left a trace of their efforts (such as Dubcek's shoe, or a mismatched background, or jerky rear screen seams) that the skilled or tutored viewer could note. This is no longer the case with present technology. Changes can be effected by the operators of modern technology and no one will be the wiser.

The possibilities are legion, then, for changing historical records on film, both still and motion. The opportunities to combine elements that were not originally in juxtaposition is also appropriate. Lee Harvey Oswald could be inserted into "documentary" footage in any number of countries or cities that might secure the basic arguments about his role in the Kennedy assassination. The potential for abuse of this technology is enormous.

This does not mean, however, that this technological power will be employed in this fashion. Fuzzy-headed thinkers are forever sounding one alarm or another indicating that evil use will be made of each new twist and turn in technologies' path. The one unsettling element in **this** arena is that we may never know it has been done.

It's a subject that bears careful watching and tracking in the future for those who care about visual literacy, the historical record, political propaganda, and our survival as free human beings.

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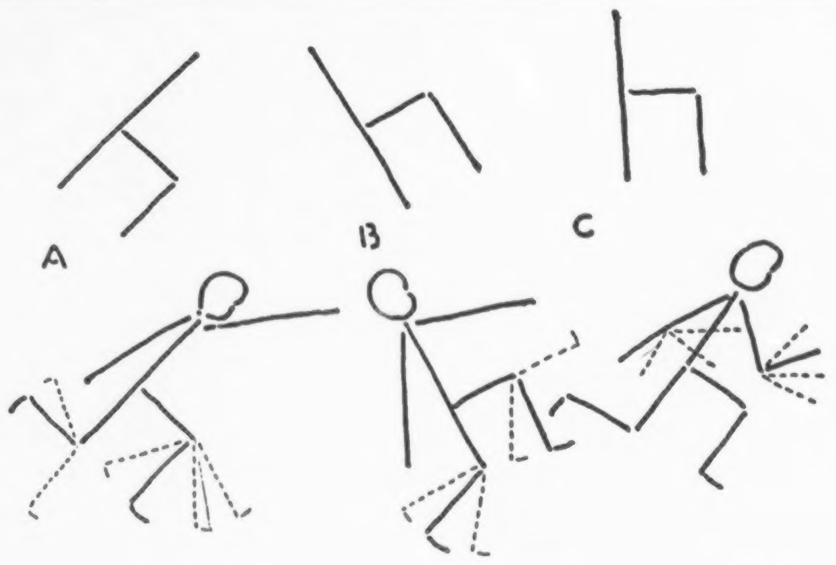
The Hand of the Artist: The Missing Ingredient in Computer Graphics

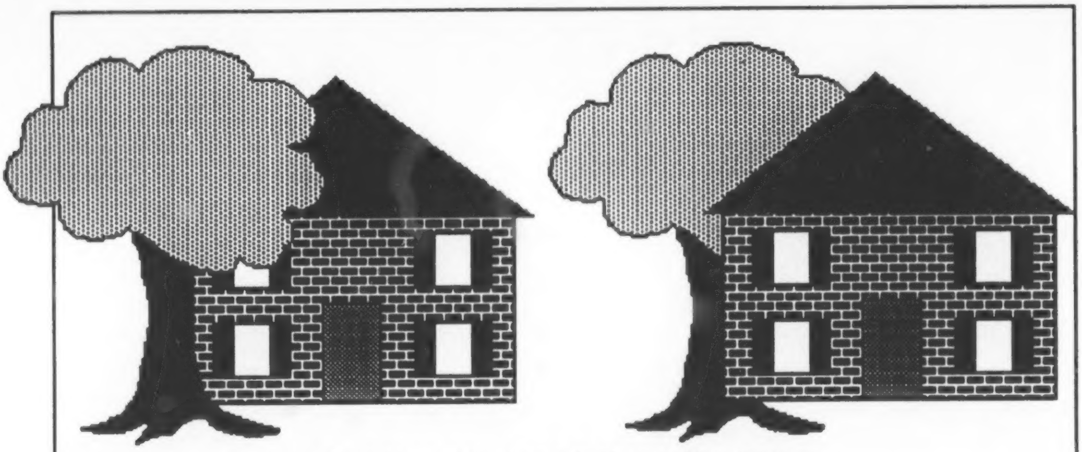
Hal Glicksman

There is a very persistent notion in drawing instruction books for children that drawing is the perception of underlying shapes. This idea has survived numerous revisions of art education curricula. By age eight, 95% of children have given up drawing forever, in large part because this method of drawing fails to develop their perception.

The tutorials that come with computer graphics applications also reinforce the notion that drawing is an accumulation of basic shapes. The lessons and examples reveal the underlying assumption about art



To learn to draw people in action, study this page. First a chair is drawn, then head and arms are added and in a little while, you can draw lots of busy people. from *The Art Teacher* by Pedro Lemos, 1931



Sending the tree behind the house

(From the manual for *Superpaint*, 1988)

of the creators of these packages, and the graphic tools themselves are intended to support drawing in this fashion.

One tutorial instructs us to use the arc tool to draw one side of an apple. Copy it, flip it and, voilà, a perfect apple. The pencil tool is used only to detail the intersections and plug gaps in the line so that the poured-in texture won't run out. Once the user makes the effort to draw a leaf in this manner there is no need to ever draw it again. By copying, stretching, flipping, rotating and pasting, a branch full of "different" leaves may be drawn, and from that a tree and an entire forest.

The processes by which images are created determines the way they look and, ultimately, an aesthetic develops, based on the strengths and limitations of the medium. It is understandable, therefore, that computer graphics images so often float on a plane that shades off to infinity. Translucent spheres float in space and magically distort the grid patterns that show thru. Shiny metallic letters roll and flip in space. Fractal alligator skin covers block-like furniture.

I was curious to see if Perceptual Skills in Drawing, developed by Dr. Betty Edwards, could be used to give students control over the graphic capabilities of the computer, and in the process help them escape the sequential, manipulative way most images are created on the screen. In other words, could the hand of the artist humanize computer graphics?

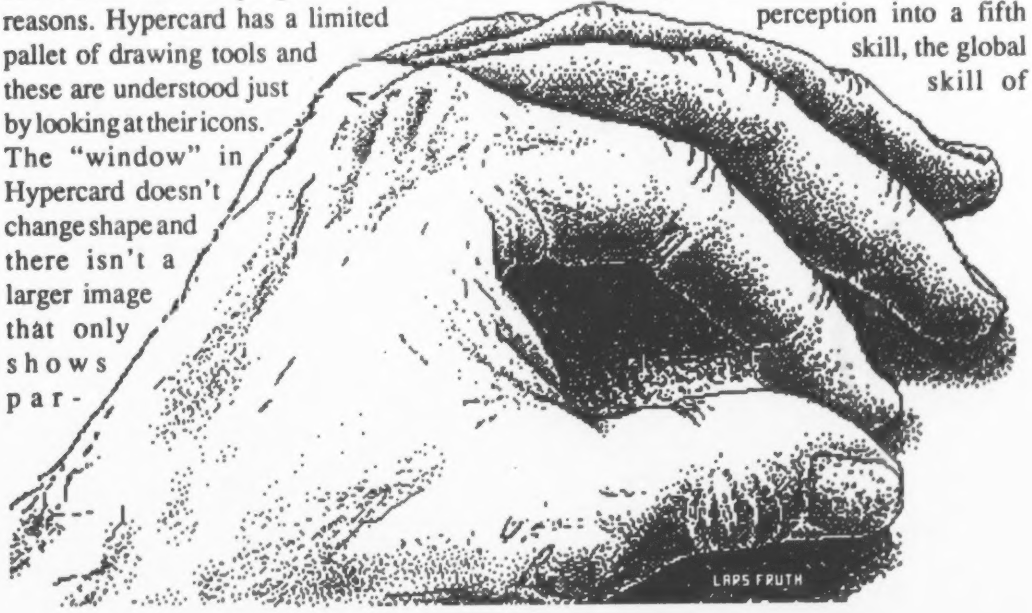
"Drawing with the mouse is like drawing with a potato." says our friend, Professor Rolf Faste, who teaches visual thinking to design students at Stanford. The digitizing tablet is not a solution to this problem because you must still learn to move your hand in one place and watch the results on a screen in another place. Art students are particularly frustrated by this, because years of acquired skill seems to vaporize when they first use the computer.

A contour drawing of the hand is a good exercise to introduce drawing on the computer, and is the way to master the mouse.

It forces one to slow down, and there is no temptation to draw one finger and copy it three more times. Only the pencil tool is needed and there is less anxiety about all the unfamiliar icons, tools and processes the student sees in the menus but hasn't learned to use. Hand-eye coordination is quickly established and the results are satisfying to the students. The lab is completely silent and concentration is intense. The reaction of visitors is interesting; "Are they taking a test?" "What program are they using?" as if some new type of algorithm is doing the drawing. "The program is called 'Art' " I tell them.

Computer operations are only introduced to the class as needed, and I "walk them thru" saving, backing-up and finding files until they are comfortable with these concepts. In fact they learn these processes effortlessly and help each other when they forget something.

The drawing exercises will work with any "paint" type application. I chose Hypercard as the students' first program for several reasons. Hypercard has a limited pallet of drawing tools and these are understood just by looking at their icons. The "window" in Hypercard doesn't change shape and there isn't a larger image that only shows partially in the window. This is important, since Perceptual Skills methods emphasize working with the format and composing to fill the paper or screen. Hypercard saves automatically, although Murphy's law is still with us, and students can find ways to lose everything. Hypercard starts out easy, but has many features and levels of complexity. Students are lured into learning beginning programming for special effects and organizing their work.



For the knee-foot exercise, the student uses a viewfinder to compose the knee and foot in dramatic foreshortening. This forces the student to utilize the entire screen and think in terms of composition. The drawing of a plant in negative space also reinforces the format and begins to utilize other graphic tools. I emphasize developing the drawing in stages, keeping each stage as a separate drawing. These stages can then be linked by Hypercard into a simple animation sequence.

The goals of Perceptual Skills training is the integration of four skills of visual perception into a fifth skill, the global skill of drawing. These skills are combined in the computer class by creating a self-portrait drawing. It is a fortunate capability of the computer to be able to keep copies of the drawing in various stages and to allow different solutions to the final portrait to develop. First the negative space is blocked in. The proportions are properly sighted and few contours drawn. From this beginning a rich contour drawing is done. A copy of an early stage is developed into a drawing with dramatic light/shadow. Several drawings are done with different line qualities and gestures.

The self-portrait contains that illusive ingredient called 'content' that is stimulated by the strong psychological response we have to our own visage. It is good that we always have this interesting subject with us, since it is physically impossible to bring models or still life set-ups into the computer lab.

What is the use of learning to draw on the computer? Can't better drawings be made with pen or pencil and scanned into the computer if necessary? Wouldn't the students rather learn "Pagemaker" so that they can get jobs?

I believe that drawing lets the student take command of the computer from the very beginning. They learn to create with the tools at hand and make drawings that reflect the nature of the computer screen By overcoming the limitation of pixels and stair-step lines they make drawings that seem natural to the medium. I make a comparison to wood-block printing. Good wood-block prints derive strength from the severe limitations of the medium, and appropriate images are chosen to emphasize the expressive quality of the wood grain.

I believe further that a concentration on drawing helps the student get a global grasp of computer operations more easily, and in a way that lets them learn new application programs faster. They intuitively look for the common elements in programs rather than the differences. The problem at hand is creating a good drawing or a good design. They know that the program will not do it

The goal of Perceptual Skills training is the integration of four skills of perception into a fifth skill, the global skill of drawing.

1. The perception of edges	**Taught by contour drawing**
2. The perception of empty spaces	**Taught by drawing negative space**
3. The perception of relational angles and proportions	**Taught by sighting**
4. The perception of light shadow	**Taught by light logic**
5. The perception of the gestalt	**Integration of the above skills**

for them so they are less concerned with the "features" of different graphics packages.

The real payoff for computer graphics is just being hinted at now. Visual ways of processing information and conveying it to others is having a profound effect on physics, mathematics, and the life sciences. Problem solving with drawings has always been the fortè of the artist. Now these abilities can be brought to the sciences and to the world through the computer.

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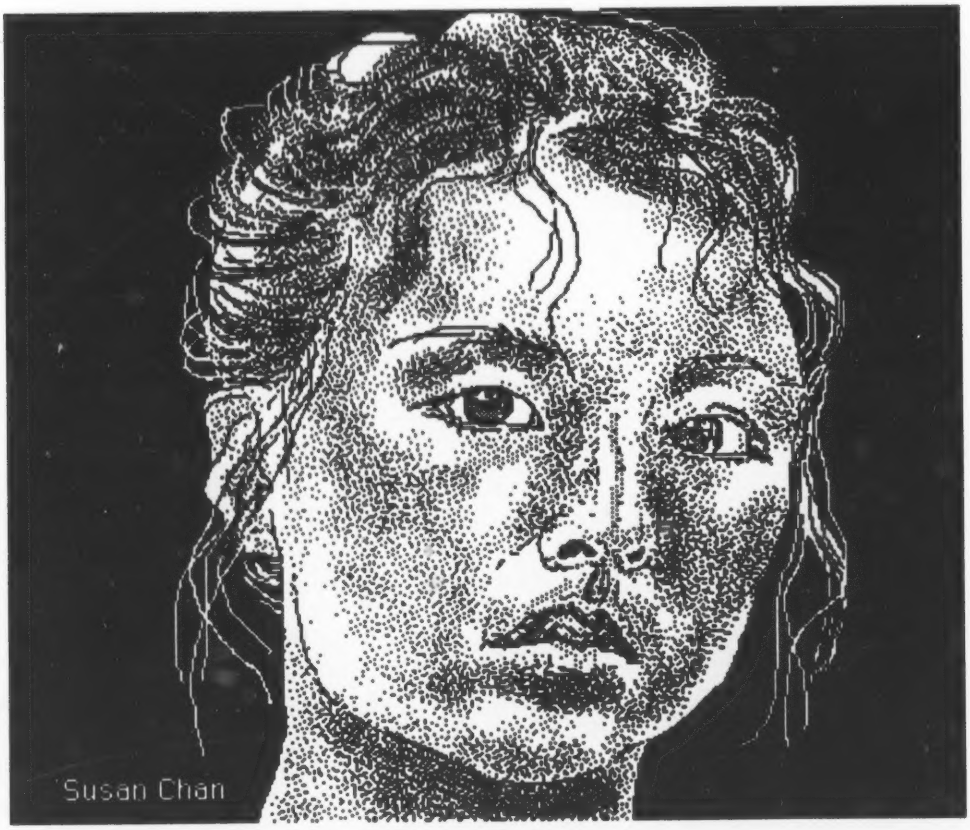

Recognizing Bias: A Visual Literacy Lesson from Beijing

Joseph A. Braun, Jr.

As a participant on an aborted four week faculty exchange to China, I witnessed the mood and evidence of widespread civil unrest in Beijing on June 4 and 5, 1989. Fortunately, the following day our group was able to book a flight to Dalian, a peaceful northeastern seaport and the home of Lianoning Normal University, our sponsor and sister institution. We stayed there five days until a return flight to the United States could be arranged.

Our stay in Dalian afforded a unique opportunity to observe Chinese television reporting their version of events in Beijing, Shanghai, and elsewhere within the country. We noted sharp contrasts between the orchestrated Chinese televised reports, the Western radio broadcasts we monitored, and the firsthand knowledge we gained in Beijing. An even starker contrast was apparent when we returned home and viewed what **our** print and television media were reporting about these events. Essentially, the Chinese media showed only soldiers being attacked by rioters. On the other hand, our media focused on the soldiers attacking unarmed civilians. More accurately, the crowds had become increasingly unruly, roughing up some policemen and, as a noted scholar of Chinese described, "When the military was brought in, the troops' lack of crowd-control training and equipment led to a cycle of viciousness on ***both*** sides." (Nathan 1986, A36) Thus, our observations of both Chinese and Western media were powerful reminders of the importance of accurate information in a democratic society and the power of media selection of visual images to shape our images of world events.

This article addresses the importance of recognizing biased information in a society that operates on democratic principles. It begins by offering a rationale for studying the phenomenon of individual inclinations and preferences that leads to seeing the same information differently. This results in biased or prejudiced accounts of events that are reported as news and visual images which are consumed by citizens who assume it is factual. A case study, based on the events surrounding the Tiananmen massacre, will be used to illustrate this point. The article concludes with suggestions for a lesson to help students at any level study the phenomenon bias and develop global awareness.

Rationale

The official accounts of events on Chinese television ran directly counter to our personal experiences. For example, the group's stay in Beijing began on Sunday afternoon with no knowledge of the massacre and resulting battles between citizens and the military in the early hours of that morning. Our travels through the city and the group's arrival at a hotel across from Beijing University, the fountainhead of the democracy movement, indicated nothing out of the ordinary. The next day we began our scheduled tour as planned; it did not take long, however, to realize that something was terribly wrong. With the exception of our group's small mini-bus, there was little traffic. In fact, the streets were filled with rubble and people milling around, examining incapacitated vehicles--mostly armored personnel carriers and military trucks. While we witnessed no actual fighting, evidence of the recent widespread and intense violence was obvious. Rubble was everywhere and the ruins of many vehicles were still smoldering. At a major intersection to Changan Avenue, a few blocks from Tiananmen Square, we watched crowds of people on bicycles riding up to view the tanks and soldiers in the distance. Remarkably, however, no information concerning the violent conflict was being reported on Chinese media.

Finally, on June 8, four days after the fighting began, broadcasts about the riots appeared on Chinese television and radio. These reports maintained that no civilians died within Tiananmen Square itself. According to the official version, the violence broke out when soldiers were attacked by a few hooligans among the crowd in the streets. A strange and beguiling contradiction emerged: apparently, military censors had unwittingly approved television footage clearly showing the vast extent of the fighting. To discourage further uprisings, however, the official commentary steadfastly insisted the fighting involved only a few people, most of whom were quickly apprehended by the authorities.

Common sense dictates that it takes more than a small circle of friends to stop armored personnel carriers and military convoys in their tracks. Identifying such a contradiction requires what Beyer describes as the individual's "ability to judge the authenticity, worth, or accuracy of something" (1987, 32). One television news correspondent described the Chinese media's biased version of the turmoil as "figments of reality." In other words, because the government controls the press and nightly news, it preferentially selects glimpses of information, and through the accompanying story line, shapes what people come to believe and understand.

We in the U.S. and other Western nations, in contrast, are awash in information and vigorously resist government interference in the precept of freedom of the press. We, however, suffer from a glut of information and are becoming immune to how the preferences of others, be they government spokespeople or journalists, and our own inclinations, result in a biased consumption and reporting of events.

To illustrate how the media in an "open" society can confuse and shape interpretations, consider some of the other headline reports and evening news stories about the aftermath of June 4 in China. Stories in the U.S. were circulated of imminent civil war following the attack at Tiananmen Square. Two separate accounts led to widely reported but specious headlines. The first involved an assassination attempt on Premier Li Peng. The second account described tanks taking up defensive positions against each other and troops from the 27th and 34th divisions of the Chinese army shooting at one another. Both of these accounts proved unfounded and reports of civil war and attempted assassination were eventually withdrawn, although few were retracted with an analysis of how the fictitious stories were reported in the first place. The "unnamed Chinese," who were the sources of these stories, turned out to be students who keenly understood how to feed into the Western media's preferences and inclinations. Thus, the Western media became partner to very biased reporting and **millions** believed it without question. Could our gullibility be a result of our wish that the Chinese government topple as a result of its atrocious act?

China, however, is not the only example of bias in the reporting and consumption of information about world events. In 1988 the U.S. Navy downed an Iranian airliner over the Persian Gulf. Consider the contrasting perspectives of this tragedy as portrayed through U.S. journalists versus media in Middle Eastern countries such as Syria, Iraq, or Iran. Similarly, the U.S. Armed Forces invasion of Grenada was reported and interpreted with vast differences and discrepancies. The impact of biased information on our understanding of the world, and our world standing, is of paramount importance. As Solzhenitsyn notes, "In spite of the abundance of information, or maybe partly because of it, the West has a great difficulty in finding its bearings amid contemporary events" (1978, 39). What visual images are we seeing of the recent embargo and troop buildup in Iraq? How will our reactions to this event change when visual images of dead and dying soldiers are circulated?

Social studies education must strive to improve decision-making capabilities in preparing citizens for the twenty-first century. Part of this preparation should include the ability to recognize bias in visual information. When provided appropriate lessons, students can begin to recognize bias as a two-way street. It is the preferences of others, and our own inclinations, that impinge upon the impartial judgement of events. The following section will describe a lesson that helps students recognize this human tendency. This lesson can be modified and used with students of any level to increase their awareness of bias and global understanding simultaneously.

Categorizing Photos: A Lesson in Recognizing Bias

If the ancient Chinese proverb "A Picture is Worth a Thousand Words," is true, then the ability to interpret information from a collection of photographs would be worth a great deal. A strategy suggested by Beyer (1987) is adapted to demonstrate how individual inclinations and preferences may lead to a biased interpretation of visual information (or visual illiteracy). Beyer explains the following procedure for helping students develop classification skills.

1. State purpose/goal.
2. Skim information to note interesting features/items.
3. Take first (or any one "striking") piece of information. Find one more piece like it and put the two together.
4. State - as a label - the feature that these two pieces have in common.
5. Add similar items to this group.
6. Repeat, starting with another piece of information, until all items are grouped.

Other Useful Rules to Follow:

1. If you do not understand an item, put it in a "miscellaneous" category and continue, but return to it later and try to use it.
2. If data show more than one thing, they can go in several categories (Beyer 1987, 112).

Try this strategy with the photographs appended to this paper. Sort these pictures to reflect life in China from June 4 to 11. Of course, accuracy depends up on some familiarity with events in China at this time (see resources below), how completely and consistently the above procedure is followed, and to what extent individual inclinations or preferences create biased groupings. For example, two photographs might be identified with Beijing and the insurrection, rather than Dalian, where life was simple and unaffected by the events in the capital. The reader might have been inclined to classify photograph C with Beijing or with the democracy movement because of the familiar two-fingered salute. Actually, the photograph shows two gentlemen waving goodbye after a banquet dinner and was shot several days after the events in Beijing, when it already was highly unacceptable for an official of a university to show solidarity with the students. While Photograph D shows a man shooting a rifle in a scene that **might** have taken place in Beijing, it was also taken in Dalian and is of a gentleman hunting sparrows for dinner. If you didn't understand these contexts, then individual preferences and inclinations could lead to misinterpretation of the information. This exercise underscores the importance of helping students understand how a **photograph isn't always worth a**

thousand words when viewed through biased eyes.

Recent news photographs of events such as oil spills off the Alaskan and New England coasts, earthquakes in San Francisco and China, evidence of food shortages in the Soviet Union, Ethiopia, and other countries can be used for this activity. An emphasis should be placed on the special geographic consideration that should be given any global event analyzed. *Life* and *National Geographic* are other resources rich with stimulating photos. With a thoughtful eye for photos that could be used with this activity, a teacher at any level - kindergarten through graduate school - could help students develop visual literacy and have a springboard for a class discussion of world events.

CONCLUSION

We do not know, and probably never will, how many military personnel and civilians were actually killed in and around Tiananmen Square the morning of June 4, 1989; estimates range from 300 to 3,000 civilians alone. Although the Chinese government reports arrests numbering about 2,000, one wonders how many will actually be victims of the repressive actions taken by the government, including purges within the Chinese Communist Party. Approximately 100 people have been executed to date for their participation in the unrest, but how many executions will be carried out unannounced? Amnesty International and other human rights groups contend that the Chinese government does not stop imprisoning or executing people - it simply stops reporting about it.

But access to information is not by itself adequate for citizenship in a democracy. A recent bulletin from the National Council for the Social Studies, focuses on this issue (Laughlin, Hartoonian, and Sanders, 1989). The editors quote from an unpublished final report by the American Library Association Presidential Committee on Information Literacy: "Citizenship in a modern democracy involves more than knowledge of how to access vital information. It involves a capacity to recognize propaganda, distortion, and other misuses of information." (Laughlin, Hartoonian, and Sanders 1989, 30). In contrasting ways, media and press bias in both China and the West was apparent as visual images were selectively shown. This manipulation provides poignant lessons about the importance of instilling visual literacy in our students. Allowing students the opportunity to view and discuss visual images of current events and consider the global ramifications is a vital learning experience for preparing citizens for the twenty-first century.

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(Note: Portions of this paper originally appeared in an article that was published in the November/December 1990 issue of *Social Studies and the Young Learner*. The National Council for the Social Studies granted IVLA permission to reprint portions of "Lessons from Tiananmen Square: Recognizing Bias in News Reporting."

These photographs, taken at various times and places, help to illustrate the concepts described in this paper.

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Introducing Visual Terms to Computer Science Students

Nancy Holmes Fister

Good visuals captivate and hold everyone's attention. Trying to understand visuals is a lifelong goal for many people. What is that picture trying to convey to me? What is that advertisement *really* trying to say? Why do I find this picture so interesting and that one so distracting? In attempting to "read" visuals an individual needs to understand the basic language of visual terms.

The language of visuals needs to be presented to students in order for them to more clearly understand visuals. The comprehension of such terms as depth, perception, pattern etc. will enable them to be able to more fully understand and "see" visuals. Although some of the basics of this language can be developed in younger children of grade school age, many of the terms are better suited to an older audience of adults, high school, perhaps even some junior high school students.

In an effort to present some of these terms to a BASIC computer science class, it was decided to integrate the terms with the computer and public domain clip art. This would familiarize the students with the basic terms of visuals before they began to create their own computer-generated graphics.

What developed was a Computer Aided Instruction on Visual Terms. This program presented the different terms, along with examples from clip art books. The student was able to go through the program at his own pace and see actual examples. He was also to return to any frame or visual that he wanted to review.

Developing the Program

In looking for visuals to use in the program, It was decided to use available clip art as clip art. Some clip art is copyright protected while other clip art may be public domain. If it is public domain, it can be freely used without infringement on any copyright laws. The clip art chosen was "copyright-free art for the printing of publications, newsletters and the like." Examples of various terms were chosen, the images were scanned in using a computer and a hand-held Logitech scanner and saved to a disk.

The next step was to use the PC Paint program to develop the title screens to introduce the visual terms. It was decided to utilize a program that had already been developed using PC PILOT and the Advanced Features Library. The program was originally developed to be used in presentations. It allowed the user to show computer-generated visuals, charts, graphs, etc. using a computer, an overhead projector and a device that interfaced with the computer to transfer the image to the overhead. Since the program was already designed to let the user go forward, backward or to a designated screen, it was a simple matter to place the title screens and the graphics into the final product.

Selected examples

The visual terms selected to use in this presentation were chosen because a computer is capable of illustrating them. They were depth/perspective, framing/windowing, motion (apparent and real texture. Some of the special effects that a computer is capable of generating were also demonstrated. These were explode, fade, implode and wipe.

One of the first terms decided upon was depth or perspective. The clip art example in Figure 1 was chosen in an attempt to have the students notice that the people in the background are smaller, the tracks come together in the background and the train depot itself also seems to taper off into the distance.

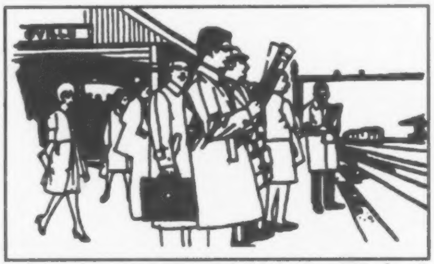

Figure 1 Depth/perspective

All of the visual terms had at least two different clip art examples to help re-enforce the term. Some of the examples were much easier to find in existing clip art than others. One of those was the term framing or windowing. One of the examples chosen is shown in Figure 2. Notice how the legs are framed by the legs of what appear to be polling booths and by the curtain itself.

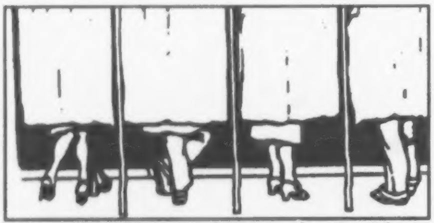

Figure 2 Framing/windowing

The final example illustrates the visual presentation of motion. Apparent motion was demonstrated by means of pictures in which one could tell that the subject was caught in the process of moving. The other was actual motion. The computer is capable of recreating or capturing motion. An example of apparent motion is shown in Figure 3. The young woman is obviously walking toward the observer.

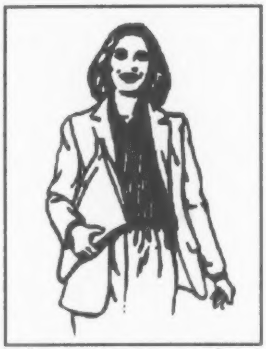

Figure 3 motion

Results of use

Students seemed to have a better understanding of visual terms after having had this brief exposure to them. The graphics that they handed in were much better in relation to previous years. Hopefully by exposing them to visual terms and ideas, before the actually created graphics, they were more conscious of these elements as they created their graphics.

Summary

A presentation of this type could be utilized in other classes as well. One that seems rather obvious would be Art or Art Appreciation. By presenting these terms or elements in simple forms the students should then be able to recognize them in works of art. It could also be useful when students are absent as the program can be run on any IBM compatible computer. It was designed in the simplest of formats, CGA, so that it would run on any machine.

Today, special programs have been developed that will let the user create similar presentations. There are many fine computer programs, both for the IBM world and the Apple (Mac) world.

GRAPHICS:

Graphic Products Corp., Graphic Source Clip Art: Adults, 1986.

Graphic Products Corp., Graphic Source Clip Art: Men, 1986.

Graphic Products Corp., Graphic Source Clip Art: Women, 1986.

Visual Sleuthing: Adolescent Detectives And Picture Book Clues

Landra L. Rezabek
Linda M. Goldman

Abstract

This paper reviews ways in which picture books can be used to foster the visual skills of young people. The design of picture books and the visual elements of art demonstrated in the illustrations provide clues to the content of books. Discerning adolescents can learn to detect these visual clues and to use similar visual elements when illustrating their own stories. This paper includes suggestions for picture books to use when discussing book design and visual elements of art, summarizes experiences encountered when conducting visual literacy activities in a sixth grade classroom, and briefly describes plans for further classroom research.

Introduction

Proponents of visual literacy have noted that picture books represent a natural means of stimulating discussion about both visual and verbal communication when working with young people (Kiefer, 1988; Lacy, 1986b; Stewig, 1988). Lessons developed around the connection between picture books, reading, and writing are traditionally targeted toward elementary age students and the literature is replete with examples of successful programs which draw upon the relationship between picture books and verbal communication when working with youngsters (Castle, 1986; John, 1985; Read & Smith, 1982; Stewig, 1990; Wilson, 1987).

Unfortunately, the advent of adolescence often marks the end of young people's exploration of the ways in which visuals and verbals work together to communicate. The traditional structure of the school day changes from one of integrated verbal/visual lessons directed by a single elementary school teacher to a middle school or junior high school schedule of separate "art" or "English" classes and multiple subject-area instructors. In addition, a young person's interest in picture books often is stifled by a misplaced but prevailing notion that picture books are "juvenile" and somehow not appropriate for young adults.

The purpose of this paper is to share preliminary efforts in developing, implementing, and evaluating lessons designed to provide adolescents with opportunities to explore the link between visual and verbal communication using picture books as a catalyst. The paper will focus on how adolescents can develop visual and verbal literacy by "detecting" important "visual clues" from picture books. The paper will provide numerous visual examples from picture books, will outline activities appropriate for use with adolescents, and will discuss plans for continuing research in this area.

Visual Literacy, Young People, and Picture Books

Since before the days of Dick and Jane, young people have been exposed to visuals in the reading materials that they use daily in classrooms. Many educators have moved beyond seeing illustrations in books merely as ways to motivate reluctant readers or to stimulate readers' imagination (Rice, 1981) but as materials capable of extending the visual literacy of youngsters. Along with an increased emphasis on verbal literacy, there has been a call for developing the visual literacy of students as well (Considine, 1987; Lacy, 1986b; Stewig, 1986). Advocates of this position cite the fact that not only do we receive almost 80% of our information visually (Debes & Williams, 1974) but that today's visual images play an increasingly significant role in knowledge acquisition and daily activities in general (Lacy, 1987).

But as Stewig asserts, "Simply being surrounded by visuals doesn't mean that we automatically become more sophisticated in interpreting and reacting to them" (1986, p. 2). Many teachers and other adults assume that young people naturally understand and interpret visuals in meaningful ways. Unfortunately, this assumption is often unfounded (Brody, 1982). Because young people do not necessarily develop the ability to look at pictures and acquire the intended visual message from them, many proponents of visual literacy encourage classroom teachers to accept responsibility for consciously helping students develop the skills needed to be visually literate (Castle, 1986; John, 1985; Lacy 1986b; Stewig, 1988).

Some teachers may balk at the thought of accepting responsibility for still another facet of a young person's development, but promoting the visual literacy of young people can be accomplished through a variety of interdisciplinary classroom approaches (Lacy, 1987). One natural and logical way to integrate visual literacy into the classroom is by having young people and teachers work with picture books.

There are several advantages to using picture books to enhance visual literacy. Books are a natural part of the classroom environment, come in a variety of reading levels, and cover an almost endless range of topics. Picture books can be integrated into numerous subject-specific classroom activities in areas such as science and social studies. In addition, reading comprehension (Kiefer, 1988) and writing ability (Sinatra & Beaudry, 1989) appear to be enhanced when visuals are used in conjunction with printed text. Books also can illustrate a wide variety of visual elements which teachers can draw upon in many creative ways. In addition, many of the visual skills learned by looking at pictures and illustrations in books are transferable to other contexts and other visual media. As Nodelman observes, teaching about and with picture books helps young people share "the joy of discovering a meaningful aspect of visual information" (1988, p.20). For young people to discover and respond to the visual aspects of books, teachers themselves must be conscious of the many ways that picture books and illustrations help enrich, support, and extend the printed word and must help develop this type of visual awareness in their students.

Picture Books: Basic Clues for Students . . . and Teachers

Professionals suggest that learning to "see" the information contained in visuals may be a multifaceted process (Stewig, 1988; Lacy, 1987). Stewig (1988) suggests that teachers help students move through a three step process to accomplish this goal: First, young people describe what they see; then they compare the visual being studied with other visuals; and finally, students work at valuing one of the pictures they are studying. Lacy (1987, p. 16) offers another perspective and indicates that teachers can guide students' visual awareness by asking a series of questions about visuals: "What do you see?" (identification); "How is the visual put together?" (analytical); "Why is the visual as it is?" (interpretive); "How successful is the visual?" (evaluative); and "Can you make a visual?" (production). Both Stewig (1988) and Lacy (1987) indicate that teachers should begin to develop students' visual awareness by helping students describe and identify visual elements and progress toward the evaluation and production of visuals.

Picture books are particularly useful in encouraging young people to describe what they see and in helping students develop a vocabulary for talking about visuals. Both the design of picture books themselves and the visual elements of art that are used to create illustrations offer important visual clues to student detectives willing to spend time investigating the visuals that accompany printed word. The brief summary below will remind many teachers of clues their students will want to look for when investigating picture books.

Clues from Book Design

Before young people open a picture book, they are given a visual message about its contents. The size, shape, and illustrations on the jacket of a book are the first elements readers encounter, and each of these visual elements offers a clue about the book itself (Harms & Lettow, 1989). For example, ask young people why A Tree is Nice (Udrey, 1956) is rectangular in shape. Ask why People (Spier, 1980) is so big while A Tale of Two Bad Mice (Potter, 1904) is so small. Ask young people if they can tell from the book jacket what kind of journey Cassie takes in Cassie's Journey (Harvey, 1988) As Nodelman (1988)

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suggests, students use the size, shape, and book jacket design as sources that provide a foundation for understanding the book. Though many students may already be aware of these visual clues to a book's contents, others may need to be reminded of the clues provided by these elements of a book's design.

Other clues to a book's contents may be contained in the endpapers and title page. Endpapers, the pages pasted to the inside covers, often depict visual motifs found in the story or reinforce the mood of the book. For example, a butterfly and a cherry blossom on the endpapers of Crow Boy (Yashima, 1965) symbolize the changes that take place in the main character in this story. The endpapers of Arthur's April Fool (Brown, 1983) depict a collection of tricks, from sneezing powder to plastic ice cubes, thus helping set the mood for this humorous tale.

The title page is often ignored by a young reader unless someone helps the young person to "read" it. As Huck (1979) points out, the title page of Bear Circus (Du Bois, 1971) depicts kangaroos peeking into the circus tent, one of them peering over its shoulder as if to invite the reader along. In My Dog Tripp (Ray, 1987) a girl and a dog, noses touching, are pictured in a way that immediately establishes the relationship between the two and helps set the mood of the story for the reader. Teachers can draw attention to the end papers and title page, as well as to other elements of book design, by asking a variety of questions which elicit personal responses from young people.

Clues from Visual Elements of Art

There are many visual elements contained in picture book illustrations which continue to establish and reinforce theme, mood, setting, and characterization of the story. These visual elements include the use of color, value, line, detail, artistic conventions, and a variety of other elements of art not discussed in this paper. Interested teachers are encouraged to consult one of the many available sources describing visual elements in art such as A Primer of Visual Literacy (Dondis, 1973) or Art and Design in Children's Picture Books (Lacy, 1986b) for more information that will help them encourage their students to detect visual clues in picture books. A few selected visual elements and some picture books that offer interesting examples of these particular aspects are reviewed below.

Color.

Color is perhaps the first feature to which young people respond. And, along with artist's choice of medium and style of art, color helps set the overall mood or atmosphere that controls the viewer's understanding of the illustrations within a book (Nodelman, 1988). Color, which has many associative and symbolic meanings, has great power to create tone and mood in picture book illustrations. For example, yellow often is associated with cheerfulness, blue with serenity, purple with royalty, black with depression or danger, and red with intensity, anger or love.

Just as authors who want to emphasize a word underline it or put it in boldface or italics, illustrators use color to highlight an aspect of the picture which in turn often reinforces a theme or plot element of the text. The viewer's eye is drawn to Rose Blanche, the heroine in Rose Blanche (Innocenti, 1985) as she wears her bright pink skirt amid the background of destruction and deprivation in Nazi Germany. In The Mountain (Parnall, 1971), the colors used in the illustrations change gradually from color to black and white as man ruins the environment. Lack of color in illustration also conveys a message. Ask young people why they think the drawings in Dakota Dugout (Turner, 1985) are in black and white and not in color or why the illustrations in Caldecott winner Arrow to the Sun (McDermott, 1974) are composed primarily of black and shades of orange. By guided examination of the use of color in picture books, teachers can help young viewers understand subtleties of story and theme.

Value.

The use of value, or the darkness and light within pictures, is a "powerful but intellectually elusive element" (Lacy, 1986a, p. 39). Value is used to reflect mood or setting. The book Dawn (Schulevitz, 1974) illustrates how the gradations of light reinforce the passage of time in the story. Jumanji (Van Allsburg, 1981) demonstrates how the use of light and dark is used to add to the mysterious, almost dreamlike mood of the story . A teacher might ask young people how Jumanji (Van Allsburg, 1981) would be different if the book were illustrated with bright colors instead of relying upon the contrasts between light and dark.

Line.

Line in picture book illustration is more difficult for young people to recognize but this element of art functions in many subtle ways. Many times, line is used to direct the reader's eye in ways that reinforce the mood or content of the story. In Freight Train (Crews, 1978), left-to-right directional line is used to imply movement. In other illustrations, vertical lines seem to "trap" the reader's attention temporarily within the field of action, circular lines lead the eye around and around, and diagonal lines often reinforce a sporadic, unfocused action or setting. The book Hiroshima No Pika (Maruki, 1980) uses black erratic lines with flowing shapes to convey a sense of the panic of families fleeing the bombing of Hiroshima (Kiefer, 1988). The use of line can provide important clues to the content and mood of the book.

Details and Artistic Conventions.

In addition to color, value, and line, many book illustrations contain details and artistic conventions that teachers can help young people notice and understand. Young people may benefit from directed viewing activities with picture books, for details in illustrations often are overlooked and artistic conventions may be misunderstood by those with limited visual experience.

Details in illustration serve several purposes. First, details provide information about the story not included in the text. For example, the narrative of 1 Hunter (Hutchins, 1982) is little more than a basic counting text. It is only through the details in the pictures that readers learn of the number and variety of animals that slowly are surrounding the one hunter on his journey through the jungle.

Readers recognize and interpret many visual details on their own which is part of the pleasure of "reading" picture book illustrations. However, some significant details may be overlooked by young readers. For example, Nodelman (1988) discusses how, using Burkert's illustrations of Snow White (Grimm, 1972) the teacher might wish to draw attention to the objects on the evil queen's cluttered workbench: a tarot card with the number 13 on it, a spider in a web, the deadly nightshade plant, mushrooms, and a skull. Separately, these items might be insignificant, but collectively placed around the poisoned apple, they are seen as symbols of the evil personified in the wicked queen herself. Teachers can direct young people to these kinds of details which often are rich with symbolic meanings. In addition, the study of visual details in picture books offers opportunities to increase awareness of visual details in a multitude of other media that young people encounter daily.

Visual details sometimes supply the most meaningful aspect of a picture book story. If young people were to read Ahlberg's Each Peach Pear Plum (1978) without seeing the hidden fairy tale characters within the illustrations, not only the meaning but the pleasure of reading this book would be greatly diminished. The clever details in Piggybook (Browne,1986) foreshadow the impending action and help the reader predict what will happen. These details also add humor and visual puns to the written text, and young people who overlook these visual clues will miss much of the fun of the story.

Adults may assume that young people will attend to and understand visual details, including a special type of detail known as an artistic convention. Artistic convention are often found in cartoon style art and include examples such as the use of straight lines coming out from a light bulb to indicate that the bulb is shining or dotted lines being emitted from a person's eyes to indicate the line of sight. Young people having limited experience with illustration may have difficulty understanding such conventions unless their meaning is explained. Again, teachers can discuss the use of visual conventions to make sure that young people detect the visual clues contained in picture book illustrations that support and extend the meaning of the text.

Summary

Whether it is through the design of the book itself or the use of specific elements such as color, value, line, and detail in illustrations, picture books communicate information about the story. Nodelman (1988) suggests that these visual elements communicate more universally and more readily than do words. But teachers must be sure that young viewers are detecting the visual cues contained in the books. By helping young people more thoughtfully examine and interpret the visual elements in picture books, teachers support the interactive process between reader and book that contributes to both the meaning and pleasure inherent in the picture book experience.

Classroom Detective Work

The Scene of the Crime

In order to determine the effectiveness of some of the ideas discussed above and to test the reaction of young viewers to several of the picture books mentioned, a pilot study was conducted during September, 1990, using 12 female and 13 male students in a self-contained sixth grade classroom in a western state. Students ranged in age from 11 to 12 years and the majority represented Caucasian, middle-class backgrounds. Though an art teacher is scheduled to visit the classroom every other week, several of the art lessons had to be cancelled and both the students and the classroom teacher were pleased to have the guest speaker, Linda Goldman, come to discuss "learning how to read pictures."

Linda began the lesson talking about the impact of visuals in society. All of the students responded that they watched either television or MTV daily, and Linda stressed that people learn a great deal of information through the sense of sight. Mrs. Goldman stressed that the day's lesson focused on developing an awareness of how pictures can help communicate a message and that students would be given an opportunity to create their own visuals at the end of the lesson.

Again stressing that students would be learning how to read and write using pictures, Linda discussed both the elements of book design and the visual elements of art summarized above. Mrs. Goldman used illustrations from the titles indicated above as well as others visuals from books included in the reference section of this paper. One of Linda's major points was that picture books were not just for little children, but for people of all ages. The students involved in this lesson showed no sign of hesitation in talking about picture books. Students articulated important aspects regarding the size, shape, book jackets, endpapers, and title pages of books. Students not only could describe what they saw but also could provide possible motives for the illustrator's artistic decisions that were apparent in the book design.

Students also were aware of the use of visual elements of art used in many of the illustrations. Students were particularly animated when discussing the use of color. Many students made the traditional associations between colors used in the illustrations and the moods that these colors represented. Students noted and explained the choice of color in illustrations and one student mentioned the loss of color in Parnall's book, The Mountain (1971): "The colors are fading away and the pictures tell you what's happening to the environment even though the words don't." Linda stressed that "illustrators purposely think about the colors they use" and that students needed to think about the colors as well.

One student knew the artistic meaning of the term "value," and students saw the use of light and dark demonstrated in Jumanji (Van Allsburg, 1981). The students observed that Stevie (Steptoe, 1969) had heavy, sad lines in its illustrations and that Hiroshima No Pika (Maruki, 1988) used confusing lines and shapes to create a sense of the chaos of the aftermath of the atomic bomb.

Students especially enjoyed the discussion of detail and were intrigued by the "I spy" nature of the hidden figures in Each Peach Pear Plum (Ahlberg, 1978) and the array of evil artifacts in Snow White (Grimm, 1972). Piggybook (Browne, 1986), with its clues foreshadowing the action, was a particular favorite of many of the students as well as most of the adults who had come to observe the lesson.

The discussion that Linda led combined elements of a book talk with a lesson on visual literacy, and after about forty minutes, three stories were read aloud to students who were then asked to illustrate one of them, concentrating on the use of color, value, line, or detail. Students were provided with copies of the text of the stories The Paper Bag Princess (Munsch, 1980), Grandfather Twilight (Berger, 1984), or Once a Mouse ... (Brown, 1961). Students were not shown the illustrations from these books so that they would not have preconceptions of the "correct" types of illustrations. Students were quite anxious to begin illustrating their favorite story and, in fact, many of the students had to be forced to go out to recess on a lovely fall morning! Because of time limitations for the initial session, students were given additional time during the week to work on their illustrations.

When Linda returned to the classroom a few days later, the teacher had encouraged students to turn their illustrations into books to display during Parent Night. Unfortunately, the stapling process involved in the bookmaking activity frequently marred the quality of student visuals, but students nevertheless were pleased with their artistic endeavors.

When interviewing students about their illustrations, Linda noted that some students consciously did emphasize visual elements when producing their pictures. One girl who said she "couldn't draw" admitted that she thought about the mixtures of colors she used to create a drawing of the night sky and sea when illustrating Grandfather Twilight (Berger, 1984). Another student indicated that he had included a string of "z's" floating above the head of a dragon as an artistic convention to make sure the viewers knew the beast in The Paper Bag Princess (Munsch, 1980) was asleep. Other students used visual clues unconsciously, but were able to explain their decisions when questioned. One girl said that she had drawn "rays" emanating from Grandfather Twilight's chest full of pearls to indicate their special powers, but said that she had not really thought about her decision before she had drawn the figure. From interviews with students, it became clear that color, detail, and artistic conventions were the aspects of illustrations students felt most comfortable in using, though many did so unconsciously. Students still appeared to be uncomfortable with the vocabulary used to talk about illustrations. Students indicated that not only would they like to have more time to use the new vocabulary words to talk about visuals, but that they would like to have more chances to look at visuals and more opportunities to produce visuals as well.

The Evidence in Retrospect

This activity was successful in many ways and both the students and the classroom teacher expressed their appreciation to Mrs. Goldman for sharing her expertise in reading visuals. However, this experience also provided information that will be useful in improving similar lessons that are currently being planned. First, the success of using picture books with sixth graders encourages the continuation of current efforts to use picture books outside of a self-contained classroom with sixth, seventh, and eighth graders in a middle school setting. None of the students indicated that the activities were juvenile and, in fact, students said that they enjoyed learning how to "read" pictures. During the lesson, Mrs. Goldman consistently stressed that being "visually literate" was a skill that people of all ages needed to develop and Linda frequently shared picture books that she told the sixth graders were "too advanced" for younger students. When working with older adolescents, this emphasis on "picture reading" as a lifelong skill will be retained.

The greatest shortcoming of this lesson was the relatively large amount of time the guest speaker *talked about* the visual elements of picture books and the comparatively small amount of time students actually manipulated the visual elements. Obviously, this particular lesson was a guest presentation and Linda had only a few hours to interact with students and to guide the visual learning activities. The middle school lessons being planned will extend over a greater period of time, thus allowing the teacher to concentrate on one aspect of book design or one visual element of art at a time. Students then will have the opportunity to discuss and to practice different aspects of picture book design and illustration over an extended period of time and to receive more feedback on their work.

In addition, instead of asking students to illustrate pre-selected stories, the ultimate goal of the intended middle school project will be for students to write and illustrate their own stories and to document their visual and verbal efforts in the form of a book. Plans are being formulated for the language arts teacher to assist students in verbally expressing their ideas and for the visual arts teacher to include illustration and bookmaking activities in the classroom. Collaborative efforts such as these may help students see the connections between visual and verbal communication. Language arts and visual arts teachers involved in long-term cooperative lessons will be better able to monitor the pace and sequence of these visual/verbal activities and to take advantage of both structured and serendipitous learning opportunities to enhance students' visual literacy.

Summary

Illustrations provide visual clues that often reinforce and at times carry the message of a picture book. Picture books can be used as catalysts for discussion of principles of book design and visual elements of art that may help students increase their visual literacy. Lessons incorporating picture books can be designed to interest adolescents, and students appear to enjoy both identifying and employing visual cues in picture book illustrations. Language arts and visual arts teachers may be able to use picture books as a central focus in collaborative lessons to foster verbal and visual literacy in young people.

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Crews, D. (1978). Freight train. New York: Greenwillow.

Du Bois, W. (1971). Bear circus. New York: Viking.

Grimm, J. (1972). Snow White and the seven dwarfs: a tale from the Brothers Grimm. Translated by Randall Jarrell. Illustrations by Nancy Burkert. New York: Farrar, Straus and Giroux.

Harvey, B. (1988). Cassie's journey. New York: Holiday House.

Hutchins, P. (1982). 1 hunter. New York: Greenwillow.

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Maruki, T. (1980). Hiroshima no pika. New York: Lothrop.

McDermott, G. (1974). Arrow to the sun. New York: Viking.

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Parnall, P. (1971). The mountain. New York: Doubleday.

Potter, B. (1904). The tale of two bad mice. New York: Frederick Warne & Co.

Ray, D. K. (1987). My dog Tripp. New York: Holiday House.

Schulevitz, U. (1974). Dawn. New York: Farrar, Straus.

Spier, P. (1980). People. Garden City, NY: Doubleday.

Steptoe, J. (1969). Stevie. New York: Harper.

Turner, A. (1985). Dakota dugout. New York: Macmillan.

Udrey, J. (1956). A tree is nice. New York: Harper & Row.

Van Allsburg, C. (1981). Jumanji. New York: Houghton, Mifflin.

Yashima, T. (1965). Crow boy. New York: Viking.

Picture Books for Developing Visual Literacy

Book Design

Size.

Spier, P. (1980). People. Garden City, NY: Doubleday.

Potter, B. (1904). The tale of two bad mice. New York: Frederick Warne & Co.

Shape.

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Value.

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Van Allsburg, C. (1981). Jumanji. New York: Houghton Mifflin.

Line.

Crews, D. (1978). Freight train. New York: Greenwillow.

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Steptoe, J. (1969). Stevie. New York: Harper.

Detail.

Ahlberg, A. (1978). Each peach pear plum. New York: Viking.

Aliki, (1983). A medieval feast. New York: Thomas Crowell.

Browne, A. (1986). Piggybook. New York: Knopf.

Grimm, J. (1972). Snow White and the seven dwarfs: a tale from the Brothers Grimm. Translated by Randall Jarrell. Illustrations by Nancy Burkert. New York: Farrar, Straus and Giroux.

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Educating for Visual Literacy Through the New Technical Graphics

Terry L. Burton
Scott E. Wiley

I. Introducing the "New" Technical Graphics

Before discussing Technical Graphics and visual literacy, it may be necessary to provide the reader with a new perception of the field. The name "Technical Graphics" projects an ordinary next door neighbor feeling that may cause some to assume an acquaintance with it that may no longer be true. In the past Technical Graphics has been taken to mean engineering drawing, mechanical drafting computer assisted design (CAD), or architectural illustration. But new technologies have altered the parameters of Technical Graphics so much that it can now be called the "familiar stranger" of visual disciplines.

The assumed familiarity and the controlled, technological, industrially flavored sound of the name has caused some to look upon it as a limited subclass of other fields such as fine arts, industrial design, or engineering. To them, Technical Graphics may not yet have been recognized as a separate field. But to professionals in Technical Graphics today, this view is inaccurate and reveals a need to promote an awareness of the field, for it has come of age as a legitimate self-standing discipline. As partial evidence, the Board of Higher Education of the State of Indiana recently approved the first bachelor's degree program in Technical Graphics; effective Fall of 1991. It is offered through the Department of Technical Graphics in the School of Technology at Purdue University.

Technical Graphics has been redefined as "the graphical communication of technical information." As such, it includes the design, presentation, and publication of graphics, technical artwork, and technical documentation, generated by freehand, mechanical, and computer processes (Wiley, 1989a). Technical Graphics is a broad visual discipline; a visual communication discipline that aids in the design, documentation, and marketing of technical information. It relates strongly to a number of already recognized fields (see figure 1) and is heavily influenced by emerging computer graphics technology. Due to these considerations the development of visual literacy is a constant, primary goal of Technical Graphics education.

Those who teach Technical Graphics are responsible to prepare competent

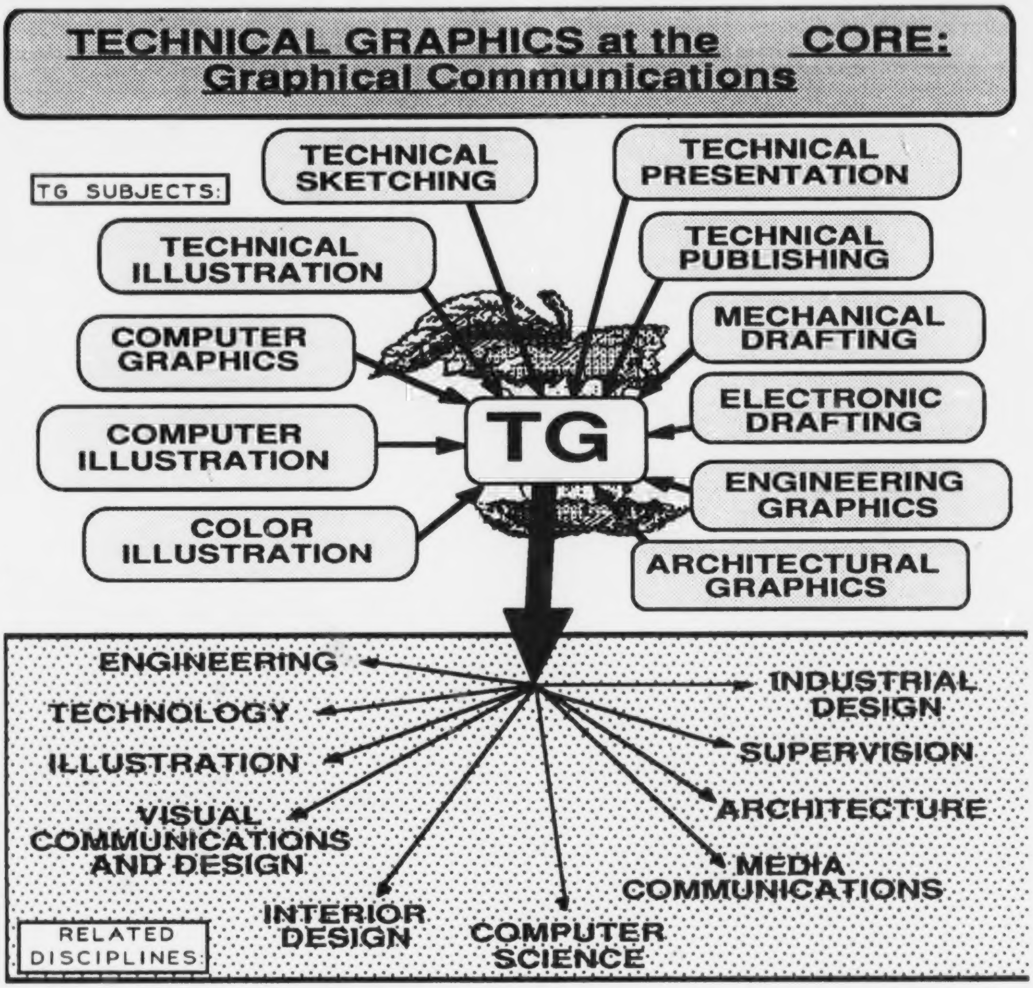
TECHNICAL GRAPHICS at the CORE: Graphical Communications
TG SUBJECTS:
TECHNICAL SKETCHING
TECHNICAL PRESENTATION
TECHNICAL ILLUSTRATION
TECHNICAL PUBLISHING
COMPUTER GRAPHICS
MECHANICAL DRAFTING
COMPUTER ILLUSTRATION
TG
ELECTRONIC DRAFTING
ENGINEERING GRAPHICS
COLOR ILLUSTRATION
ARCHITECTURAL GRAPHICS
ENGINEERING
INDUSTRIAL DESIGN
TECHNOLOGY
SUPERVISION
ILLUSTRATION
ARCHITECTURE
VISUAL COMMUNICATIONS AND DESIGN
MEDIA COMMUNICATIONS
INTERIOR DESIGN
COMPUTER SCIENCE
RELATED DISCIPLINES:

Figure 1

practitioners of technical graphics for business, industry, education, and other domains. Students in Technical Graphics are guided through a curriculum that increases freehand, mechanical, and computer skills which lead to the effective communication of technical information in widely diverse fields. As examples; course projects may require the development of color illustrations for communicating product features, mechanical drafting to display architectural information, or computer illustrations to portray anatomical data about the human body. Technical graphicians may work with engineers, industrial designers, computer technicians, advertisers, scientific and medical personnel, interior designers, architects, and many others to facilitate the communication of technical information through graphics that combines images and text.

As in other visual disciplines, the development of visual literacy is important in Technical Graphics for two primary reasons; to increase the ability to produce visual products that communicate effectively, and to increase the ability of others to clearly understand them. These considerations can mean anything from mastering surface rendering techniques in prismacolor, to correct interpretation of technical information on engineering drawings, to the design of geometric models for use in high end computer animations.

Every area of Technical Graphics necessitates intimate knowledge of visual production and communication. Visual elements and principles must be controlled whether the graphical product is on paper or disk, uses traditional or computer processes, or combines text with images. Lines, forms, colors, contrast, positive and negative space, light, and many other components must be manipulated to enhance communication. Technical graphicians are visual producers who must be able to control and understand the complexities of visual products at all phases of a design sequence so that communication is as clear as possible. An underlying goal is to enable visual consumers to understand what has been produced. Due to the emphasis on technical communication through such diverse media, the technical graphician has a great need to be visually literate in many kinds of media.

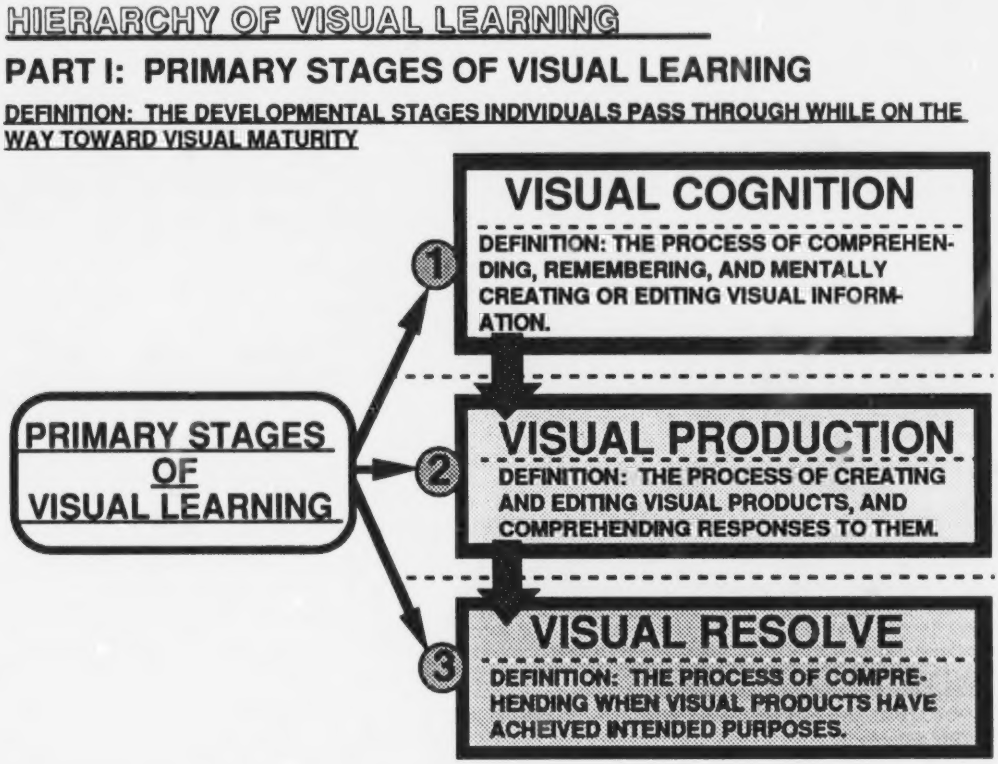
HIERARCHY OF VISUAL LEARNING
PART I: PRIMARY STAGES OF VISUAL LEARNING
DEFINITION: THE DEVELOPMENTAL STAGES INDIVIDUALS PASS THROUGH WHILE ON THE WAY TOWARD VISUAL MATURITY
PRIMARY STAGES OF VISUAL LEARNING
1
VISUAL COGNITION
DEFINITION: THE PROCESS OF COMPREHENDING, REMEMBERING, AND MENTALLY CREATING OR EDITING VISUAL INFORMATION.
2
VISUAL PRODUCTION
DEFINITION: THE PROCESS OF CREATING AND EDITING VISUAL PRODUCTS, AND COMPREHENDING RESPONSES TO THEM.
3
VISUAL RESOLVE
DEFINITION: THE PROCESS OF COMPREHENDING WHEN VISUAL PRODUCTS HAVE ACHEIVED INTENDED PURPOSES.

Figure 2

II. Visual Literacy as a Primary Goal of Technical Graphics

Technical Graphics has its deepest roots in engineering graphics and descriptive geometry. But it also has strong ties with other visual disciplines and diversified fields such as publishing. At its heart is an orientation toward the design and manipulation of geometric modeling, especially within the computer environment. It is a broad, visually rich field that challenges students as they pass through complex learning experiences that bring them into contact with a wide variety of techniques and processes.

Visual literacy is actively taught in all phases of Technical Graphics. As students pass through stages of visual learning they grow in visual perception and visual memory abilities which in turn increase their internal visualization skills. Growth in visualization enables them to externalize their ideas more competently during the entire design process. As they progress, they learn to continually edit their projects to improve communication. In the production atmosphere of a lab class they receive valuable feedback from others about how well their projects communicate intended goals. The design process is terminated when these goals have been reached. Figure 2 illustrates the three primary stages of the visual learning sequence under discussion: visual cognition, visual production, and visual resolve. As shown elsewhere (Wiley, 1990a,b), these stages are not unique to Technical Graphics alone but are based on psychological constructs related to many visual fields.

Individuals develop visual literacy skills as they pass through these three primary stages. The first stage, visual cognition, is an internal mental stage. Visual information is first mentally comprehended, then remembered, created, and edited mentally before it is externalized. During the second stage; visual production, visual information is externalized or brought into the open through the design process where it can be reacted to and edited. Visual resolve, the last stage, is reached when the externalized visual product no longer needs refinement. It is finished when the producer has realized it has achieved its intended level of communication.

These three primary stages of visual learning contain seven hierarchical stages that explain more fully the visual learning process:

1. Visual Perception: mental comprehension of visual information
2. Visual Memory: mental storage & retrieval of visual information
3. Visualization: the mental creation & editing of visual information
4. Externalization: creation & editing of visual products throughout a design process
5. Transmission: communication through visual products
6. Reception: comprehending responses to visual products
7. Resolve: comprehending the termination of a design process

Organized within a model, the three primary and seven hierarchical stages appear as in Figure3:

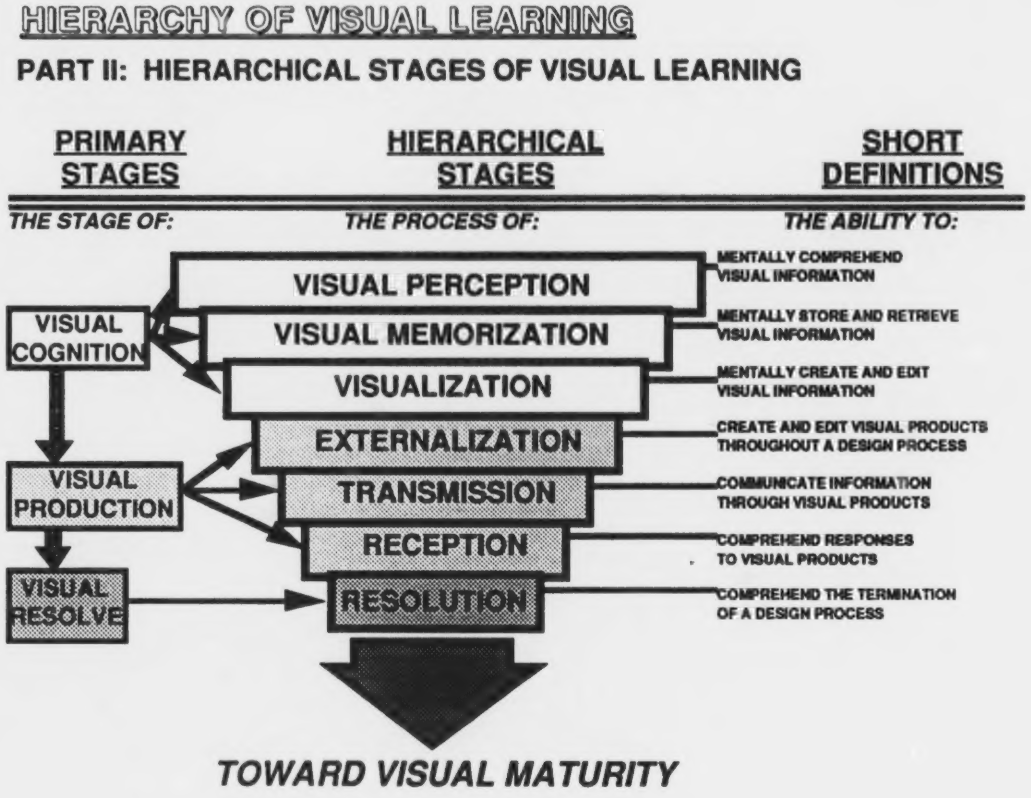
HIERARCHY OF VISUAL LEARNING
PART II: HIERARCHICAL STAGES OF VISUAL LEARNING
PRIMARY STAGES
HIERARCHICAL STAGES
SHORT DEFINITIONS
THE STAGE OF:
THE PROCESS OF:
THE ABILITY TO:
VISUAL PERCEPTION
MENTALLY COMPREHEND VISUAL INFORMATION
VISUAL COGNITION
VISUAL MEMORIZATION
MENTALLY STORE AND RETRIEVE VISUAL INFORMATION
VISUALIZATION
MENTALLY CREATE AND EDIT VISUAL INFORMATION
EXTERNALIZATION
CREATE AND EDIT VISUAL PRODUCTS THROUGHOUT A DESIGN PROCESS
VISUAL PRODUCTION
TRANSMISSION
COMMUNICATE INFORMATION THROUGH VISUAL PRODUCTS
RECEPTION
COMPREHEND RESPONSES TO VISUAL PRODUCTS
VISUAL RESOLVE
RESOLUTION
COMPREHEND THE TERMINATION OF A DESIGN PROCESS
TOWARD VISUAL MATURITY

Figure 3

The Hierarchy of Visual Learning (Figures 2 and 3) is offered as an example of how the overall umbrella of visual learning concepts can relate to visual literacy. The paradigms have been described as hierarchical; similar to Bloom's Taxonomy of Educational Objectives (1956) or Maslow's Hierarchy of Human Needs (1943). But hierarchical does not mean that one stage stops before another begins. The stages are not mutually exclusive; early visual learning stages continue to function throughout the entire process. By example, visualization continues throughout production and final resolve.

As can be seen in the model, visual cognition encompasses the three root concepts of visual learning: "visual perception", "visual memory", and "visualization." Gibson (1950, 1969), Travers (1982) and Eisner (1972, 1982) agree with the premise that visual perception precedes visual memory and the two make visualization possible. Figure 3 illuminates all three terms.

Visual perception has been defined as "the ability to mentally comprehend visual information". Visual memorization has been defined as "the ability to mentally store and retrieve visual information". And, visualization has been defined as "the ability to mentally create and edit visual information". It has been assumed then, that when we discuss "visualization" we are talking about an individual's entire visual - mental processing ability which includes perception and memory but continues to operate throughout the primary stages of Visual Production and Visual Resolve. All stages are hierarchical, so earlier stages precede later stages, are in continuous operation during them, and are influenced by competency levels in them. These principles are being advocated (Wiley, 1989c) and implemented (Wiley, 1989b) in Technical Graphics curricula.

Amount of visual literacy at any level then, has a compounding effect, which is why it is a continuous goal of Technical Graphics throughout all stages of visual learning. Like words and paragraphs in verbal fields, and numbers and equations in quantitative fields, the visual language must be broken down into discrete elements which can be learned and manipulated to bring about desired results. The technical graphician has some of the same discrete elements common to others in different visual fields; elements and principles of visual communication such as line, shape, color, value, contrast, repetition, emphasis, clarity, etc. But, the technical graphician may work in visual environments and processes that demand a different kind of visual literacy. The influence of industrial and business standards and computer technology forces a level of accurate communication through visual elements not always required in other visual fields. Color and form, for instance, may have to be controlled from within the coordinate space of a computer environment that may be very foreign to other visual producers.

III. Educating for Visual Literacy Through the New Technical Graphics

There are many influences upon the development of visual literacy in visual learning. If we listed influences identified by research and those we have noted while teaching we would probably arrive at seven major ones:

1. Personal Traits: capabilities & abilities of the student & teacher
2. Educational Practices: teaching skills & methods
3. Skill Development: increasing the ability to handle media & equipment
4. Equipment Capabilities: techniques made possible by graphics equipment
5. Graphical Processes: procedures & processes which lead to correct graphical solutions
6. Visualization Devices: visual aids & equipment that accelerate the ability to understand graphical concepts
7. Visualization Cues: visual characteristics that reveal information about objects and environments

These seven major influences are featured in Figure 4. The first three major influences are oriented toward general visual learning processes. The

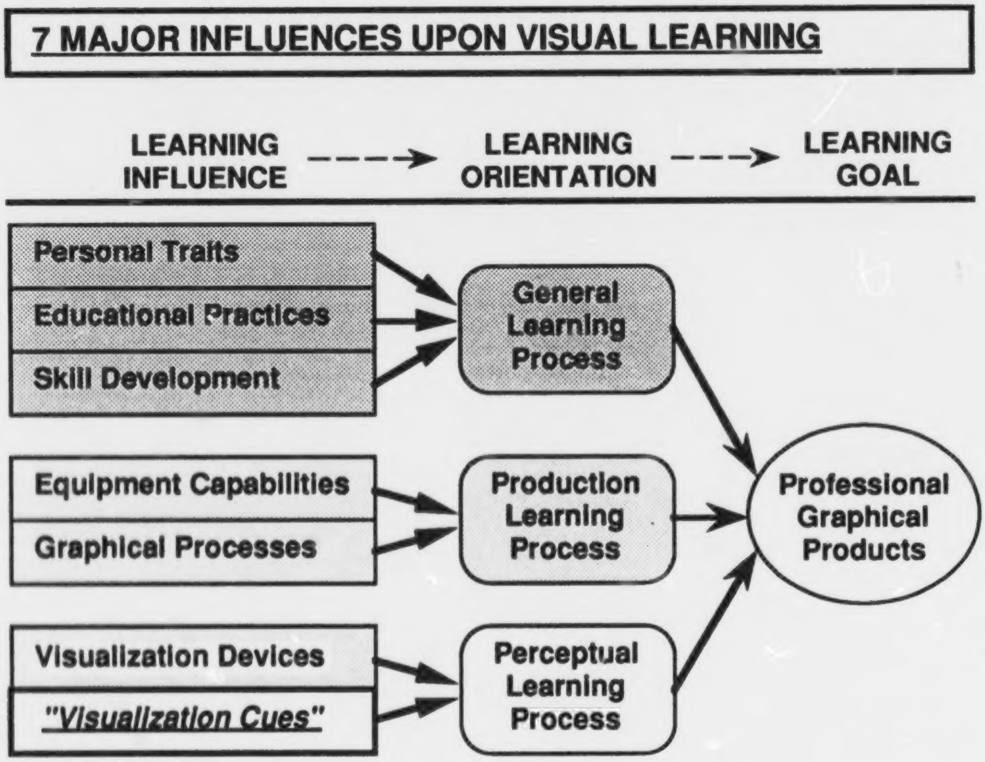
7 MAJOR INFLUENCES UPON VISUAL LEARNING
LEARNING INFLUENCE
LEARNING ORIENTATION
LEARNING GOAL
1
Personal Traits
2
Educational Practices
3
Skill Development
4
Equipment Capabilities
5
Graphical Processes
6
Visualization Devices
7
"Visualization Cues"
General Learning Process
Production Learning Process
Perceptual Learning Process
Professional Graphical Products

Figure 4

fourth and fifth are oriented toward visual production learning processes. And, the last two are oriented toward visual perception learning processes. The final learning goal is the development of professional level graphical products, visual products which communicate information effectively; technical information in Technical Graphics.

All the major learning influences have a direct effect on the quality and speed of our visual literacy development. Of particular interest to Technical Graphics educators however, are the "visualization cues" (number 7). As stated before, all visual educators have a need to develop visual literacy by breaking the visual language down into discrete elements so they can be learned and manipulated. Better yet, if they can be identified and categorized, development may be made easier. One way to isolate and categorize the complex visualization cues familiar to technical graphicians is through a paradigm that unites static and dynamic cues; those found within both traditional and computer mediums. Figure 5 indicates how these might be organized.

The organization of Figure 5 is influenced by knowledge of psychological constructs, technical graphics subject matter, and interaction with computer technology. The top section lists three types of static cues; spatial, surface, and external. The bottom section lists dynamic cues, all categorized as movement cues. Spatial cues are depth

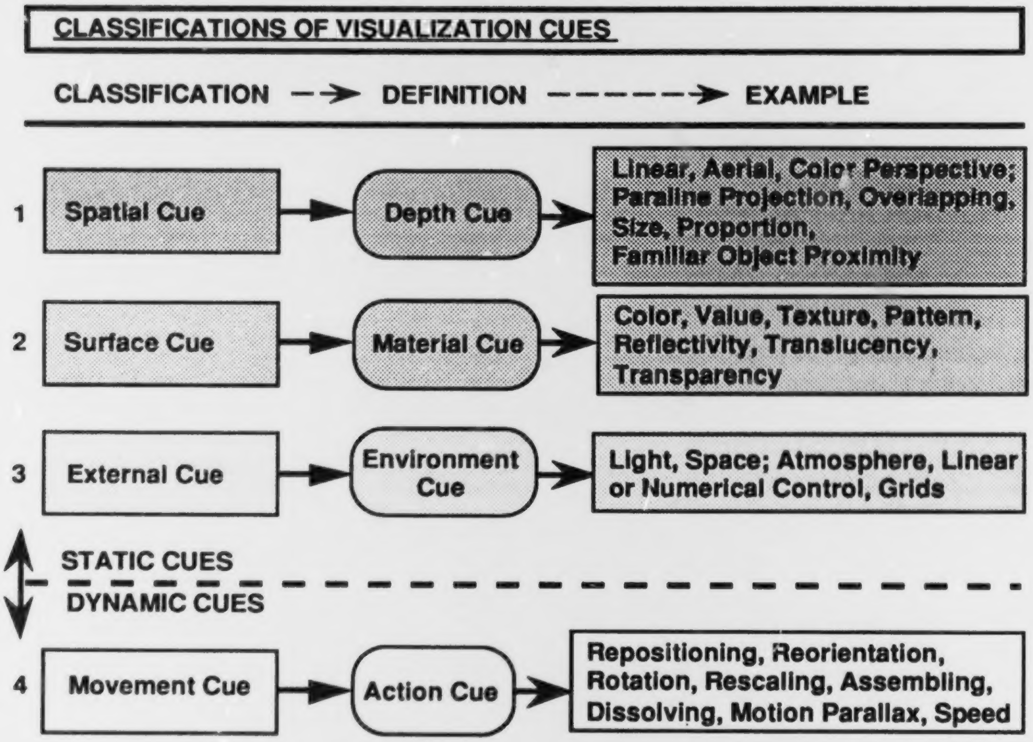
CLASSIFICATIONS OF VISUALIZATION CUES
CLASSIFICATION
DEFINITION
EXAMPLE
1
Spatial Cue
Depth Cue
Linear, Aerial, Color Perspective; Paraline Projection, Overlapping, Size, Proportion, Familiar Object Proximity
2
Surface Cue
Material Cue
Color, Value, Texture, Pattern, Reflectivity, Translucency, Transparency
3
External Cue
Environment Cue
Light, Space; Atmosphere, Linear or Numerical Control, Grids
STATIC CUES
DYNAMIC CUES
4
Movement Cue
Action Cue
Repositioning, Reorientation, Rotation, Rescaling, Assembling, Dissolving, Motion Parallax, Speed

Figure 5

cues, visual clues that reveal information about depth relationships. Surface cues are visual clues about the kind of material objects are made of. External cues are cues that exist outside of objects but influence how we perceive them, such as light sources or computer coordinate systems. Movement cues are action cues, cues that indicate real or apparent motion. Computer animation can make extensive use of many kinds of movement cues.

In the technical graphics classroom, an instructor might use this paradigm to show how one kind of visualization cue relates to others within a graphical project. By doing so, the student is brought into contact with a classification system not unlike one that classifies types of words or numbers. It enables the student to make sense out of the complex arena of visual learning.

IV. The Growing Need for the Technical Graphician

As technology continues to impact visual fields the need to understand technical information about visual production methods will increase. This will necessitate new approaches to visual learning that can integrate computer processes with traditional techniques and media. And, as technology and computers proliferate in the work world, the need for visually literate technical graphicians will grow.

This principle was eluded to by Alvin Toffler who popularized the idea of technological shock for the general population (1970), and for educators (1974). If he was right in his generalizing, then the visual producers of the future will have to assimilate a great array of visual concepts in order to deal with the complex task of producing visual information in a high tech environment. And, technical graphics educators will endure the same in their effort to stay abreast of technological advancements.

V. The Compatibility of Creativity and Technology

Creativity, as a teaching process or curricular goal, has sometimes been thought to be confined to specific non-technical disciplines such as the fine arts. In addition, some sciences claim the right to teach creativity, citing that science is the discovery or creation of new knowledge and is therefore a creative subject. Most educators could agree with this but might argue that creativity has no place in technology subject areas. Since technology has usually been thought of as the applied use of scientific knowledge, some educators, even traditional technical graphics educators, feel that creativity should not be an educational goal at all. One need only explore the history of traditional technical graphics curricula to discover a bias against creativity and an orientation toward "cook book", "round peg-round hole", and "tool manipulation" courses. Due to these limited views, technical graphics courses have usually been thought of as service courses for broader disciplines, such as engineering.

Are there other reasons why critics think of technical education as being more manipulative than creative? A partial answer may be a failure to recognize the technical sophistication that increasingly impacts the field. It may also be a failure to recognize the potential that creative technical graphics has to impact the rest of the educational community through its power to communicate visually. In short, the impact of technology on technical education, and specifically technical graphics, has been a "shock" that works against the realization of its potential. Technology has impacted the field so fast that it is hard for some to recognize that there now exists the means to change the way we teach and think. Technical graphics may even be able to play a major role in raising visual education to the status of verbal and quantitative fields.

Agreeing with the need for creativity in technical graphics is to agree with the need for a more holistic education. As Edwards (1979) suggests, it is naive to teach a curriculum that deals with the development of only one brain hemisphere (left). Traditional technical and engineering graphics education has tended to be mired down with analyzing, specifying and presenting graphics through industrial standards - a very left brain oriented activity. The analytical, restrictive, trade school perception of technical graphics has hindered the development of right brained creative activities in the field. But, if technical graphics can be taught as creativity aided by new technology, then it can lead to a more holistically educated individual.

The need to be educated in technical graphics should be recognized, so should the need to be graphically literate through technology. There is also another important curricular goal; to develop operational environments for students that will provide coping strategies in a variety of technological applications. The teaching of knowledge concepts, measured as behaviors, becomes a relevant and necessary goal of technical education. Thus, the inclusion of creativity with technology education becomes of primary importance in fulfilling and obtaining viable educational goals in technical graphics.

VI. Enhancing Visual Literacy Through a Technical Mind-Set

If visual literacy stems from a body of knowledge necessary to function within a visual environment, then technical graphics visual literacy stems from a body of knowledge necessary to perform in a technical graphics environment. This being true, it is logical to assume that a primary goal of technical graphics education is to provide students with visual experiences that will increase the knowledge and skills necessary to communicate graphically in a technical environment. By using technology as a means to an end, we are attempting to provide a broad based conceptual mastery of technical communication through graphics, instead of teaching the specific technologies or graphical drawing processes. As history has proven, the teaching of a specific technology insures educational obsolescence. (How many key-punch operators are needed today in industry?)

By holding that visual literacy in technical graphics is a primary goal, technical graphics educators are emphasizing that the utilization of specific technologies is only a means of obtaining that goal. The legacy of technical graphics has had more to do with developing psychomotor skills than developing visual literacy through technology. The attitude has existed that by emphasizing drawing skills visual literacy would be increased and the educational goal met. But by using technology only as a tool to reach more globally viable educational goals, technical graphics educators can improve their traditional course content and sequence.

VII. 3-D Thinking as a Key Curricular Focus

The advent of powerful low-end computer technology and its infiltration into education has provided an avenue for developing a different conceptual approach to teaching technical graphics. Traditionally, a typical technical graphics course spent its initial curricular efforts in a two-dimensional object environment. This environment forces students to perceive objects in a limited way. It used a set of standards and conventions that has been in existence for many years. Eventually the course would move into three-dimensional (3-D) presentations of objects but would continually use the 2-D references for justification of object presentation.

As Toffler (1970) suggests in his book Future Shock, some people and disciplines, choose to cope with advancing technology by specializing. That is to say that once one finds a specific technical application that satisfies the need, the technical advancement that is occurring outside of their area that may have a significant impact on it tends to be ignored. "Techno-Stress" results from clinging to the older technology while ignoring the new technology and suffering the anxiety of feeling left behind. This is exactly what has happened within technical graphic education. Because of the development of computer technology for graphic environments, the basic philosophy of 2-D to 3-D object presentation teaching sequence is invalidated. The computer is now capable of presenting a visual environment that closely simulates reality. The need to develop 3-D visual environments to teach graphics is at hand. TG now has the means to develop 3-D tasks that provide increased visual understanding of the graphic communication environment. As a result of newer technology students can more easily develop visual comprehension strategies that are more realistic. Perceptual interaction with real 3D objects seems more viable for developing visual literacy.

A goal of technical graphics is to communicate shape descriptions of objects as clearly as possible within different communication environments. Technical sketches, mechanical drawings, or 3-D models may be necessary to successfully accomplish the act of communication. Obviously, the goal of simulating reality is of primary importance for clear graphical communication.

The 2D-3D to 3D-2D curriculum sequence change may seem like a simple change to make. But it had great impact on the thinking of the technical graphics educator. This sequencing change in graphic instruction has stimulated two engineering graphics groups to make recommendations for extensive curriculum revision at the national level. Specifically, the ACM-SIGGRAPH and NSF engineering graphics curriculum development efforts are attempting to cope with the pressures experienced during the demise of their disciplines in education. The shift toward advocating the teaching of 3-D to 2D concepts is one of the techno-stress pressures that is bringing change.

A higher reliance on 3-D computer technology by the technical graphics educator, will help to more easily achieve the outcome of becoming visually literate. The manipulative psychomotor teaching strategies of the past are not adequate to fulfill the goal of providing the graphic concept based instruction that is necessary for the technical graphician of the future. The utilization of available technology as a means of achieving curricular goals is of primary importance in technical areas.

VIII. Concept Recognition and Visual Literacy at the Project Level

By changing the focus of a curriculum, one can effectively change the outcome of a curriculum. In technical graphics, the change from a manipulative to a concept based instructional strategy develops visual literacy. Students benefit by no longer being required to spend hours behind drawing boards with typical tools. Computers and sketch pads can become as important as T-squares and triangles and eliminate the dependence on one kind of tool. Graphical concepts can be emphasized and taught through tools instead of being a byproduct of tool expertise. Technical manipulations can still be taught, but merely as a means to an end. Students can now concentrate on the graphic theories and underlying geometry that exists in all graphics no matter what tool, drawing sequence, or skill is required to teach them. The teaching of communication models, right brain- left brain thinking, object geometry strategies, problem solving, creativity, visual thinking and visual perception can replace the traditional "things-n-stuff" education in the technical graphics courses of the past.

Students can be informed that occupational success depends more upon the ability to adapt to varied graphic communication concepts than of mastery of specific technologies. The anxiety of techno-stress can be reduced by presenting them with a learning strategy that requires a cognitive level of understanding. But as yet it is probable that very few students have been challenged to develop cognition of the concepts within a discipline. Unfortunately, most public education is as guilty of being manipulative in nature as was most technical graphics courses.

The prospect of having to move to a new level of understanding is quite disconcerting to a student who has no recognized cognitive experiences. Fortunately, once a cognitive level of understanding is achieved and recognized, most students tend to seek that level of understanding in their educational pursuits. As Bloom (1956) advocated, the cognitive level of comprehension is the highest level of knowledge acquisition. Concept cognition and the understanding of concept applications provides a coping strategy that students can use to be successful in using graphics to communicate ideas and solutions.

As an example, the Department of Technical Graphics (TG) at Purdue University offers a course titled Technical Sketching. It is an entry level course that traditionally used numerous repetitive graphic interpretations of real or imagined objects which use prevailing graphic standards. Now attention is directed toward the development and identification of a communication environment for which the graphics are intended. The emphasis is to define why the student is doing the tasks and why it is to be done certain ways. The "just do it the way I show you" or "that's the way it is done in industry" attitude does not exist in the current course. This scenario no longer sets the stage for failure in developing graphic presentations that achieve the desired level of communication. If we as educators can provide a means to achieve student cognition of why something is done a certain way, then maybe we can develop more creative ways of solving graphic problems as is being attempted in the technical sketching course at Purdue.

In the TG sketching course, the definition of a typical communication model, such as Shannon and Weaver's (1947), provides a reference for determining elemental breakdown of any communication environment. By emphasizing the communication model elements within a technical graphics environment, one shows the need to adhere to standards for the purposes of encoding and decoding, helps identify avenues of possible feedback for evaluation, and provides sensitivity to the possibilities that arise in the form of interference within a graphic communique. Students tend to be more aware of the potentials for failure with their drawing as communication media, and therefore, more capable of recognizing potential problems with their presentations before submitting to instructors. A desirable peripheral outcome of this type of learning strategy is that the impact of the acceleration of technology is less. This model application is not machine or technology dependent. At present it is insulated from changes that are due to technology.

The emphasis of developing student visual literacy as a curricular goal throughout the sketching course provides the same focus on cognition as a communication model. Constructing educational activities that have as a

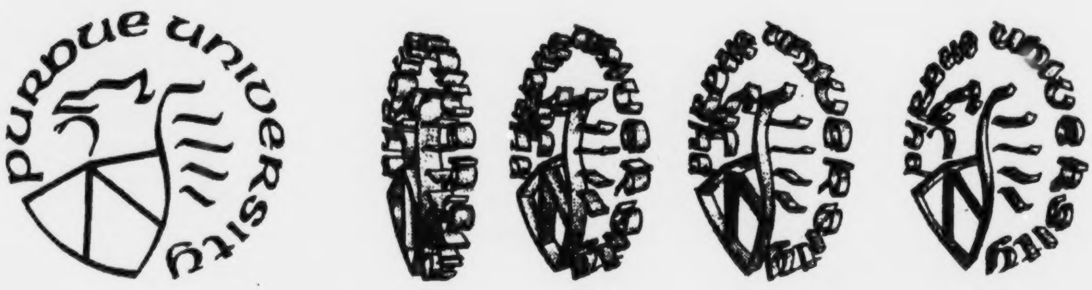

Figure 6

goal the development of visual perception abilities provides an avenue for student cognition of concepts and thus the development of desirable student attributes.

An example would be the technical sketching course activity of developing a series of iterations of the Purdue Griffin symbol as shown in Figure 6.

The project is presented as a perspective sketching activity that places a high reliance on the students achieving visual cognition of the iterations of the symbol as it passes through space. The iterations are purposely set up on axes that do not deviate more than fifteen degrees from the previous one. The adherence to fifteen degree iterations is the result of previous research that indicates the cognition of an object during rotation in axes angles of fifteen degrees or less provides a high level of visual cognition of the object and its movement. This fact is shared with students. This bit of knowledge provides not only awareness but possible applications in presentation of future iterations of objects along axes.

The realignment of emphasis within the technical graphics curriculum appears to be the direction to take to establish viable curricular content within the discipline. The emphasis of visual literacy through graphic projects seems to be developing quite well in the Purdue sketching course.

IX. Summation

The establishment of viable research goals and educational objectives within technical graphics is developing rapidly as the field flowers into a major discipline. The marriage of technology and graphical concepts within the field has powerful potential for focusing communication more toward visual methods. "Pie in the sky?" Maybe, but the authors believe this can be the emergence of a viable educational pursuit that has been desired for many years by those who advocate visual literacy. However, it is just now becoming a reality due to the capabilities of new technology.

It would be a satisfying achievement

if visual literacy education, as formal technical graphics visual perception education, were to become a requirement of many general education curricula. As educators become more aware of the significant role technical graphics can play in the development of visually literate students, it seems logical, the more desirable the implementation of formal graphics training becomes in education. Visual perception as a way of thinking, along with traditional thinking, could provide yet another avenue for students to obtain usable knowledge.

Why not develop graphic communication environments to achieve desired communication goals? Expression of ideation, in graphic form, is an effective mode of communication. Abandoning the limits of manipulative based instruction may provide the means to achieving the successful development of a high level of visual literacy. Technical Graphics can be a significant contributor in the development of successful communication strategies. When applied in a premeditated properly emphasized program, it can also be significant in the development of visual literacy in students.

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Video Critique and Production in Elementary Schools

Marilyn Bazeli

By the time children reach high school, they will be spending more time each day watching television than attending classes in school (Clark & Solomon, 1986). Therefore, it is imperative that visual literacy and instruction about television are a part of children's education.

Some studies will be reported here involving the use of television or television production for the purpose of providing visual literacy education. Then, some ideas for implementing and practicing video critique and production in elementary schools will be presented. Finally, some examples of student video productions across the curriculum will be described.

Studies About Television and Visual Literacy

Lacy (1988) advocated the use of familiar television shows, videotaped in part, to provide a basis for discussion regarding fact and fantasy in television. She stated that children may know the difference between fact and fantasy in a story, but when they see a television show, they tend to believe it is true. Using television shows to teach children to critically analyze and discuss fact and fantasy has been found to be effective in the development of visual literacy skills.

Dobbs (1988) proposed teaching visual literacy skills in the same manner that reading skills are taught, namely: introduce, then guided viewing (instead of guided reading), and then follow-up discussion and summarizing. A videotape of a story, a news presentation, or other television production could be used, with new vocabulary and necessary background information provided in the introduction. This method involves children actively in a visual experience, and develops visual literacy skills.

Television production has also been found useful in teaching visual literacy skills. Saxton (1988) wrote that instruction and practice in the use of television cameras helps children to determine fact and fantasy, and to notice and understand special effects which they see on regular television productions.

Singer, Zuckerman and Singer (1980) have researched the relationship of instruction and practice in television use to the demonstrated level of knowledge and vocabulary connected to television. It was found in that experimental research study that instruction about television does aid in developing visual literacy skills in children. They stated that instruction about television ought to be combined with reading, writing, and critical thinking, using the students' natural interest in television as a motivator.

Adams and Hamm (1987) wrote that visual competency requires that students have the ability to intelligently send as well as receive visually based communication. By involving students actively in producing television programs, students come to understand the language and symbol system of television, and to understand communication on many levels. As students become involved in controlling television, they develop skills to critically evaluate whatever they see on television.

Video Critique

Several techniques for employing video critique in the instruction of visual literacy skills will be discussed in the following paragraphs. These techniques could easily be adapted to various grade levels, kindergarten through twelve, and to various subject areas.

The skill of evaluating personality characteristics of people on television could be taught through video critique. Videotapes of clips from familiar shows could be shown to the students, with a discussion of similar or different personality traits of the characters following. Students should be asked to explain the visual clues presented in the clips which led to their evaluation of the personalities. The metacognition process should be explored in the discussion so that students can understand the processes involved in using visual clues to develop desired personalities. Further discussion could involve methods used by television writers and producers to develop the desired fictitious personalities. A natural outcome of such discussion would be the application of those methods to news reporters, presidential candidates, world leaders (such as Saddam Hussein) who are all heavily involved in creating a desired visual image to promote a specific personality evaluation in the viewer. Students need to understand the realities, both positive and negative, of such visual images.

Television production skills can be taught by the critique method. Again, clips of well-known shows could be presented, with the focus of attention on the use of close-up shots, long shots, camera angle, etc. A discussion of production terms, and the purpose or impact of each production technique would help the students become more analytical in their viewing of television.

Sequencing and importance of order can be illustrated by using segments of a television show out of sequence. After viewing such a presentation, students could better understand the importance of specific order and sequence of events in not only television, but also science experiments, narrative or expository writing, math, etc.

The attributes of visuals can be demonstrated by the use of a videotape presented with no sound. A documentary-type of videotape would probably be best for this, although other types of presentations could be used. The purpose would be to attempt to understand the presentation with only the visual channel being used. Through discussion, perceptions of the information being presented would be shared. Then, the tape would be shown again with the sound, and a follow-up discussion would point out the information gained from the visuals. This same activity could also be conducted in reverse, with only the sound presented first, and then the visual added. However, this does not focus as clearly on the visual aspect.

The concepts of fact and fantasy can be explored through television critique. Clips of scenes from "Star Wars" or "Star Trek" can be shown along with clips of the moon landing or actual space ship launches. The idea that sometimes fantasy can be more realistically portrayed than the real thing should be discussed. Strategies for determining whether a presentation is fact or fantasy would be shared and discussed.

Viewing and analyzing commercials provides a popular and excellent way to promote thinking skills and visual literacy. Analyzing the script and the visuals presented in a commercial can develop critical viewing skills in children, and a more thinking adult viewer.

Visual memory and perception can be enhanced by the following technique. A clip of a television production that is not well-known would be presented to the students. Students would then be questioned regarding the visuals in that presentation, such as objects in the background, colors of various clothing or objects, placement of furniture, trees, etc. Discussion would allow for disagreement regarding remembered visuals. Then, the clip would be presented again, with follow-up discussion of the visuals. The importance of specific visuals to the story could be discussed in relation to how well those visuals were remembered.

Problem-solving and critical thinking could be improved by analyzing a scene from a television show, and offering solutions to a problem. Student solutions could then be compared to the one depicted in the show. Fighting or violence, even though a common solution to problems on television, would be shown as only one solution, with more positive methods being better choices.

Television Production

Student-produced television shows have been found to result in increased visual literacy skills in the students. Some curricular applications of such student television productions will be discussed here.

English. Writing the script for a variety of television productions is an excellent method of using writing and communication skills, and using production techniques of close-ups, panning, etc., for desired effects. Such productions could be in connection with another curricular area, or could even be instructional videotapes in specific English skills, such as parts of speech, punctuation, etc. Children focus more on learning when they are involved in writing a script and presenting a lesson on television.

Reading. Motivating students to read is becoming an increasingly difficult task. Using our visual world to help motivate reading seems a logical approach. Book reports that are videotaped by other students and shared with other classes, or presented in the library, can promote interest in books. Book evaluations in discussion form, like the Siskel and Ebert movie evaluations, are fun for students to produce, interesting to watch, and help readers choose a book they want to read. Biography book reports, with the reporter dressed as the person in the biography, also add interest and enthusiasm to the reading assignment.

Social Studies. To enhance awareness and learning about current events, students could write and produce a news program. This format could involve international news, or news in the local community or school community. Map skills, history, and geography would be utilized in this activity. Another idea could be to establish "Video-Pals" (instead of pen-pals) in other areas of the United States to enhance knowledge of areas of our country.

Science. Students who are involved in experiments or demonstrations could videotape those presentations for the entire class to view. Those videotaped presentations are often easier for a class to see because of the zooming-in capability of the video camera. Also, the action can be stopped, reversed, and viewed again for better understanding of the experiment results. The video camera can also be used in science to bring nature into the classroom. A hike into the woods, with a video camera along, would result in all students being able to see specific plants, leaves, tracks, etc., without disturbing the natural environment.

Math. Videotaping demonstrations of manipulatives used in math to develop thinking skills, such as Tangrams, Pentominoes, or D.I.M.E. Build-Ups, would be motivational to students, promote further effort, and develop self-esteem and confidence in math. Also, instructional lessons on long division, reducing fractions, etc., prepared and produced by students, could put math into the language of the students and remove some math anxiety.

Health. Commercials are fun to write and produce, and when tied to proper eating habits and healthy food, they can be educational as well. Students could select a food which is healthy for them, but not a favorite, such as brussel sprouts. They would then write a commercial attempting to convince the audience to eat that food. They may need to do research to find food value information, vitamin content, etc., and use creativity to present that information.

Conclusion

The ideas presented here are only a few of the many uses of television in schools. As some techniques for critique and production are incorporated into the curriculum, new ideas seem to generate easily. The students themselves think of interesting and educational uses of television. When using television for critique and production, teachers can proactively use television to their advantage, and ultimately produce visually literate and thinking adult viewers.

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Silhouette Illustration as Visual Information in Children's Books

Betty P. Cleaver

Introduction

Visual communication through the art of the silhouette can be traced to the shadow puppetry of India and Indonesia as well as to the papercutting art of China. Shape and the relationship of figure to ground provide a representation of reality which is interpreted and fitted into the viewer's own knowledge and experience. The art of the silhouette has persisted through the centuries, appearing in the theater, in portraiture, and in book illustration. It is the use of the silhouette in children's book illustration that will be addressed here.

Shape and silhouette illustration

In 18th and 19th century children's books, illustrations were usually black and white, with wood cuts as the most common kind of illustration. The silhouette illustration, with its black figure against a white ground, was well suited to the constraints of the printing methods then available. When Edmund Evans invented new engraving and color printing techniques, introducing them in the publication of Walter Crane's "Sixpenny Toy Books" (c 1865-1876), children's book illustration was dramatically and forever changed (Thwaite, 1972). When a faithful rendering of color became possible, artists were freed to use all visual elements in their pictorial representation and enhancement of a story. Nevertheless, the use of the silhouette as a graphic technique was retained; occasionally it was expanded from black figure, white ground to incorporate color in dark figure against light ground or light figure against dark ground.

The effectiveness of the silhouette technique, perceived instinctively by early illustrators, can be understood in the light of twenty years of study of visual literacy. Dondis (1973) identified ten basic elements, which form "the toolbox" of all visual communications: the dot, the line, shape, direction, tone, color, texture, scale, dimension and motion. She suggested that to become visually literate, one must explore and learn the quality, character, and expressive potential of these units of visual information from every point of view. These visual elements are manipulated by the techniques of visual communication to form a visual message. Dondis called contrast the most dynamic of the visual communication techniques. If we take shape, one of the basic visual elements, and manipulate it by the technique of contrast (of tone), we will have produced a silhouette.

Shape, then, is a primary element in the design and delivery of visual information through the graphic technique of silhouette. Children recognize shape. Petterson (1989) noted that several studies of children's responses to color and shape stimuli found that shape seemed to be a more important organizer than color. Four-year-olds could pair objects better by shape than color (Modreski and Gross, 1971). Pre-school children could better identify objects by shape than by color, (Ward and Naus, 1973). And children from three to eight were more apt to sort colored paper by shape than by color, (Mac Beth, 1974). Petterson's study of color-shape and shape-color relationships found that "there was no natural, spontaneous and unambiguous correlation between color and shape." (1989, p. 2). When examining children's response to color and shape, color seemed to be of secondary importance. Marcia Brown, a three-time winner of the Randolph Caldecott medal, reflected on the importance of color in children's book illustration, saying "children enjoy equally books with little or no color and books in full color" (1958, p. 5).

The terms shape and form are often considered synonyms, but a careful consideration would suggest that line gives shape a particular form; this is necessary to provide the identifying characteristics by which the silhouetted shape may be recognized. Since there are usually no visual cues in its interior, the silhouette must capture the essential attributes of the person, object, or motion being pictured.

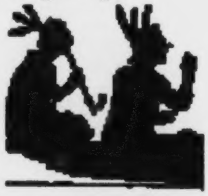
Artists who painted or cut silhouettes - and there were many talented professionals in the 18th and 19th centuries whose silhouettes give us insight into the characters and private lives of the leisured classes of

18th century society (Hickman, 1968, p. 35)- many of these were convinced that their art offered truer likenesses than oil portraits. Johann Casper Lavater's Essays on Physiognomy calculated to extend the Knowledge and Love of Mankind (c. 1775) claimed that plain black profiles "were the most penetrating guide to character reading." (Cited in Hickman, 1968, p. 9).

Unique characteristics and stereotypes

When silhouettes are used as illustration, the essential or identifying characteristics are emphasized and the viewer has no shades or nuances to assist in "reading" the meaning of the visual information presented. Overemphasis on unique characteristics, when seen out of context, can lead to the promotion of stereotypes and stereotypic thinking.

One example of myth and stereotypic thinking that has developed over centuries of Euro-American interaction with Native peoples is the image of "Indians." Generalized references to American Indian or Indian culture obliterate "the erroneous diversity of ceremonies, world views, political and social organization, lifestyles, language and art" among the many groups of Native Americans. (Council on Interracial Books for Children, 1977). When children see hundreds of illustrations portraying a Native American wearing a feathered headpiece, carrying a tomahawk, or living in a tepee, a stereotype is created. The habits and characteristics of some individuals are attributed to all individuals in that group.



Silhouette illustrations have frequently been used to stereotype Native Americans by emphasizing a feathered headdress, a bow and arrow, fringed buckskins, or other images we assume to be accurate and typical of all Native Americans. Many alphabet and dictionary books use "Indian" when elaborating on the letter "I." Images of arrows, feathered headbands, and perhaps a child brandishing a tomahawk are added to the text explanation, thereby contributing to visual stereotyping. These visual images communicate powerful but inaccurate concepts to children. Widespread use of such stereotypes is a matter of serious concern, since picture books, Huck reminded us, often give children their first impressions of ethnic or racial groups. (1987, p. 220).

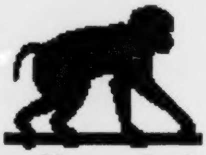
A 1938 book, Epaminondas and His Auntie (Bryant), exemplifies the worst kind of stereotyping, in this case, of Blacks. We see the silhouettes of a large "Mammy" figure with long skirt, apron, and kerchief tied around her head, and a small boy with big lips and crinkly hair standing in a posture suggestive of servility. Both text and illustrations are farcical. Such illustrations deny dignity to a people and offer a distorted view of their world.

A more recent book, Shadow, won the 1983 Caldecott medal for its author/illustrator Marcia Brown; her illustrations have been praised for their aesthetic quality and criticized in some circles for their stereotyped images. She created stunning images of the African landscape with collages of paper shapes in varied colors and density. Against this background black silhouettes of primitive figures - black except for their white eyes - "march or leap or creep menacingly through high grass. All these uses of black and unearthly white have negative connotations as artistic symbols... the artist has struck an unfortunate chord with young children - their fear of darkness, of the supernatural, and of the black of night itself." (Lacy, 1986, p. 138-39).

Gerald McDermott also used a combination of black silhouetted figures and blocks of strong color in illustrating an African folktale (The Magic Tree, 1973). This book was adapted from an animated film; the illustrations are spontaneous and fresh looking. The African design which pervades the book is indeed striking. Because McDermott used quite abstract motifs and figures, there is little possibility of stereotypic interpretation.

Silhouette illustration for identification

Silhouette illustrations have also been used in books to identify objects or animals, and here a concentration on essential characteristics is useful. In The Hiawatha Primer (Holbrook, 1989), we find silhouettes of owls and of a squirrel. The squirrel's bushy tail is effectively shown in the black figure against white ground. The silhouetted owl figures are less successful; one has to look for the broad tail wings to identify them. Some interior line is needed here - the shape is too diffuse to communicate.



Eric Daglish's classic book, The Smaller Beasts (1928), used black profiles to depict small animals such as a hyena, a wombat, a monkey, and so on, in characteristic poses. Using slashes of white to indicate inner contours, he achieved likenesses which make a strong visual statement. These illustrations provide visual information which helps children understand the meaning of the text and, in the absence of direct experience, create their own mental images of some of the animals inhabiting their world. When silhouette illustrations such as these are drawn with attention to accuracy and detail as well as to aesthetics, they contribute to concept learning.

More than forty years after Daglish's book, Ugo Mochi cut black silhouettes to illustrate A Natural History of Giraffes (Mac Clintock, 1973). Some illustrations show a single giraffe walking, grooming, or resting, while others include several animals in activities ranging from courting to fighting predators. A later book, African Images (Mac Clintock, 1984), used cut silhouettes to illustrate the whole range of African animals. Ugo Mochi rarely uses a profile; his animals are usually depicted at an angle, in three-quarter view, or head on. His own background as a sculptor enables him to focus on silhouetted shapes to convey powerful and realistic images.

The photograms of Tana Hoban might be likened to silhouette illustrations. The process is different but the effect is the same. A B See (1982) has white objects against a black background. The white shapes, created as the negative in a photographic process, become the positive element to the viewer. Shapes and Things (1970) achieves the same effect, using black and white photograms to present shapes for children to identify and enjoy. These concept books present visual information simply but dramatically.

While the most typical silhouette is a flat black shape, interior lines may be added by cutting slashes or painting white (or light) lines. Even a few interior lines will describe contours, thus giving the viewer more information. An interesting study of the drawing systems present in children's pictures (Smith and Fucigna, 1988) found that even first-grade children can render organically shaped objects [in this case, a bell pepper] using contour lines that fade, join, and occlude. If young children can do this it is reasonable to suppose they can also "read" or interpret a visual which combines shape and interior contour lines. For example, to a flat black shape of a person, one might add detail to the edge lines and indicate some interior lines. These might indicate posture, sex, age, etc. The viewer would then interpret the elaborated image as directed by the interior lines.

Shape is a powerful cue to identification, but early silhouette portrait artists frequently added interior lines by slashing along a collar line or adding gold lines to delineate hair or dress. Historians agree that the finest silhouettes were painted between 1770-1820 (Hickman, 1968), with or without bronzing and shading. Augustin Edouart, who was "supreme in his sense of character," (Coke, 1913, p. 105) cut hundreds of silhouette portraits; he argued for the pure blackness of shape. "It must be observed that the representation of a shade can only be executed by a shadow," Edouart said. "...consequently all other inward additions produce a contrary effect ... when Nature is to be imitated, the least deviation from it destroys what is intended to be represented." (Cited in Coke, 1913, p. 107).

Silhouette illustrations in children's books have been used, as we have seen, to identify or describe persons or objects. Two other functions they have filled are: 1) carrying forward the narrative thrust of a story; and, 2) providing decorative motifs for aesthetic purposes.

Silhouette illustration for narration

One of the earliest examples of a sequence of silhouette narration is the group of cuttings done to illustrate one of Gay's Fables, "The Tame Stag." (Tuer, p. 392-394). The Fables were published in a poetry collection in 1825 but the silhouettes were evidently designed and cut privately. They were discovered by Andrew Tuer, a historian of children's books, and published in 1899. These show: a stag caught in a thicket; the stag captured and given to a lord; the lord's wife begging that the stag be allowed to live; the stag eating wash hung out on a line; the stag stealing food; and finally, the stag chasing everyone in the family. These silhouettes, while fairly primitive in technique, are interesting in their narrative design.

James Russell Lowell's poem, "The Courtin', while not meant to be a children's book, was widely read by families in the late 1800's. The 1874 edition was illustrated entirely with silhouettes painted by Winslow Homer. The figures, finely drawn, are completely black - no interior lines. Homer manages to infuse the characters with motion and humor, clearly revealing the story line of the poem.

The 1920's and 1930's saw a resurgence of interest in silhouette illustration. Two major artists who used this graphic technique were E.H. Shepard and Arthur Rackham. In Cinderella (Evans, 1919) and The Sleeping Beauty (Evans, 1920) Rackham depended entirely on silhouettes to carry forward the story narrative. With his use of this difficult technique, the art of silhouette illustration reached a new peak. His remarkable sense of line, executed sometimes forcefully, sometimes with great delicacy, ranges from a single figure - Cinderella mopping the floor - to a busy crowd scene of lines and lines of women, from princesses to servants, who wait to try on the glass slipper. The princesses and duchesses are haughtily ignoring each other while, at the end of the line, the servants gossip. Rackham does not use interior line; his shapes are wonderfully expressive and his strong sense of character, which narrowly escapes caricature, dominates every page.

E.H. Shepard used both silhouette illustrations and line drawings, sometimes combining them in one illustration as in Let's Pretend (Grahame 1927) and Dream Days (Grahame, 1931). Shepard's clarity of line, his consciousness of light direction, and his genius for pointing up a telling detail are evident in these books. In a commentary on Shepard's style Bevis Hillier noted, "Only a few artists have been able to petrify movement so as to convey a still continuing force." (1980, p. 248).

Elizabeth Cleaver, in The Enchanted Caribou (1985), employed a technique which uses the effects of shadow theater to achieve a narrative sequence of silhouettes. She cut figures out of black paper, leaving slits for eyes or clothing details, and arranged them on large sheets of white paper. Each scene, on one paper, was placed behind a lighted screen and photographed from the other side. This refinement of the ancient art of shadow puppetry was particularly appropriate to the story of an ancient Inuit legend and to the bleak northern landscape of the tundra.

In another part of the world a gifted illustrator, Mitsumasa Anno, was using the oriental technique of papercutting to provide fanciful silhouetted images of Shadowland, the place where shadows go in winter when the sun disappears. (In Shadowland, 1988). He placed each silhouette illustration opposite a watercolor; this provides an exciting visual contrast. The papercut scenes carry the action of the story, commanding the reader's attention with their vigorous black shapes and their wealth of finely cut details.

Silhouette illustration as decoration

Finally, silhouettes were used in children's books for decorative effect. Sometimes they form the endpapers, as in The Real Mother Goose (Wright, 1916). At other times they were used at the beginning of a chapter or story and at the end. And they were occasionally cut into the text. This use of a silhouette illustration was not always closely connected to the meaning of the text where it appeared; rather, a scene was taken out of context and the reader might not read the text that the silhouette illustrated for several pages. Silhouette illustrations which are primarily decorative may add to the aesthetic quality of a book but they do little to give life to a story or pique the imagination of a child.

Summary

The use of the silhouette technique is an intriguing bypath in the history of children's book illustration. Silhouettes have been used to present visual information that is narrative, descriptive, and aesthetic. Jan Pienkowski's illustrations for Joseph Jacob's retelling of Jack and the Beanstalk (1977) use silhouettes for all these purposes; they carry the action, describe the scene, and decorate the pages. This small book is rich with visual information, presented in the unrelieved black shapes of traditional silhouettes.

In the past the silhouette has been used by major artists and illustrators such as Winslow Homer, E. H. Shepard, and Arthur Rackham. More recently such artists as Jan Pienkowski, Marc Brown, Paul Goble, and Marcia Brown, to name a few, have used flat, bold silhouetted shapes, either in the pure black/white treatment of traditional silhouettes or combined with line drawing and color to achieve effective connections between text and picture. In the finest work of these and other artists, silhouette illustrations become, in the words of Roger Duvoisin, a form of pictorial writing. (1973, p. 180).

The effectiveness and persistence of silhouette illustrations may be attributed to the cueing power of shape as a visual element, to the power of shape as an immediate communicator of information, and, perhaps, to the tendency of the reader to seek patterns in visual images. Children look at pictorial representations and seek relationships between the meaning of the pictures and their own experiences, between what is in the picture and what they have previously seen. (Stewig, 1988). Silhouettes provide visual cues but yet leave something to the viewer's imagination; this may be their ultimate power as illustration.

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"Drawing" to Learn Mathematical Problem Solving: How Visual Thinking is Promoted in Japanese Education

Mioko Saito

Introduction

The relationship between the use of visuals and the problem solving tasks has been discussed in numerous studies (Kaufmann, 1979; Sinatra, 1986; Fransecky & Debes, 1972; McKim, 1980). The implication of this idea for instructional designers and educators are that effective instructions for problem solving can be designed and developed by providing proper visuals to the learners. The implication for the learners, on the other hand, is that they need to learn the effective use and making of visuals for solving problems. In fact, drawing of different kinds of visuals for various situations is often taught as a learning strategy in Japanese elementary arithmetics classrooms.

This paper will discuss, by overlaying an instructional design approach, the Japanese visual representation method which is used to solve elementary algebraic problems.

Problem Solving Model

Japanese children learn how to solve algebraic problems at a very early age. However, introduction of simultaneous equations with more than two unknowns is withheld until the children are at the junior high school level. For example, the following sample problem shown in a sixth grade arithmetics workbook does not necessarily require the use of simultaneous equasions (Kyoiku Kaihatsu Kenkyujo, 1988):

> **Mr. Ikeda and Mr. Yamashita had ¥4200 together. Mr. Ikeda used ¥600, while Mr. Yamashita received ¥800 from his mother. Now Mr. Yamashita has ¥200 more than Mr. Ikeda does. How much does Mr. Yamashita have now? How much does Mr. Ikeda have now? How much did Mr. Yamashita have originally? How much did Mr. Ikeda have originally?**

In order for these young children to learn how to solve algebraic problems without using simultaneous equations, visual representations have been used although algebra is a discipline which does not lend itself to visuals per se unlike a field such as geometry.

Our sample problem can be translated into a visual shown in Figure 1.

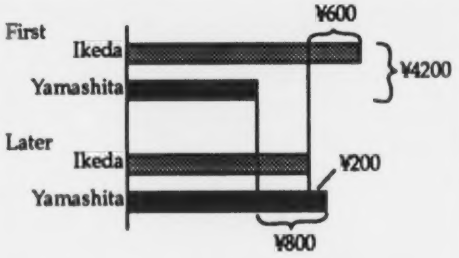

Figure 1: Visual Representation of the Sample Problem

It seems that the essentials for this method are 1) intellectual prerequisites and memory schemata, 2) pattern recognition ability, 3) problem representation and understanding, 4) metacognition process, and 5) validation of the answer.

Intellectual Prerequisites

Gagné (1985) contends that rules and concepts that are possessed as prerequisite skills are required to solve problems (or "conditions" for solving problems in an instructional design term). For instance, in order to solve our sample problem, the learners must have the arithmetics ability (i.e., addition, subtraction, multiplication, and division), understanding of the value of money, and understanding of the concept of time (past vs. present). These ability and understanding are organized in a certain way to represent a cluster of knowledge, or memory schemata (Silver, 1987). Memory schemata is associated with encoding incoming information as well as decoding previously processed information and inferring an incomplete information. The way the schema is organized is crusial to efficiently accessing information, which in turn influences the power of the problem-solving process.

Pattern Recognition Ability

One of the themes that Silver (1987) identifies as being important for completing the problem solving tasks is the ability to recognize the patterns of related information. However, the rapid pattern-recognition skills cannot develop without extensive practice in the task domain since the skills involve "episodic" or "imagistic" memory representations. Japanese algebraic word problems are categorized into numerous patterns of problem solving based on the strategy used. Some of the classical patterns include *wasazan* (sum-difference problem), *tsurukamezan* (crane-turtle problem), *tokeizan* (clock problem), *ryusuizan* (stream problem), *tsukazan* (passing problem), *tabibitozan* (traveler problem), *uekizan* (plant problem), *nenreizan* (age problem), etc., many of which are solved by using visuals.

Our example is a more complexed form of *wasazan*, in which the sum and difference are defined clearly.

Problem Representation and Understanding

Problem representations, which involve the gradual elaboration of the initial problem to reach at the stability, are central to a process of problem solving (Silver, 1987; Gagné, 1985). This representation takes place by looking for analogies between problems that are similar to each other.

Not understanding the problem, or in other words, not representing the initial problem adequately, usually leads to failure to the process of problem solving. The key is to attend to the content or semantics of the problem situation, not the surface feature (Silver, 1987).

Metacognition Process

In addition to the domain-specific knowledge, metacognition is also involved in the problem-solving process. Metacognition, or ones' knowledge about their cognitive processes, is a driving force for the managerial decision making and evaluation of the cognitive activities (Gagné, 1985; Silver 1987).

Validation of the Answer

Gagné (1985) stresses that some kind of intellectual skills are needed in order to validate the answers. In our example, after arriving at the answers (i.e., Yamashita's current possession is ¥2300, Ikeda's current possession is ¥2100, Yamashita's original possession is ¥1500, and Ikeda's original possession is ¥2700), the inverse operation needs to be operated to assure that ¥4200 is the original total, and that Yamashita has ¥200 more than Ikeda after Ikeda spending ¥600 and Yamashita receiving ¥200.

Patterns of Problem Solving

What follows are sample questions and visual representations for solving various types of problem extracted from Juken Kenkyusha (1988), Kyoiku Kaihatsu Kenkyujo (1988a), and Kyoiku Kaihatsu Kenkyujo (1988b) .

Wasazan (Sum-difference Problem)

If the day time is 2 hours 24 minutes longer than the night, what is the length of the day time?

Figure 2 shows that the length of the shorter line (or box or circle) is found by taking the sum minus the difference and dividing it by two. The key is to make clear that there are identical parts in both lines (or boxes or circles).

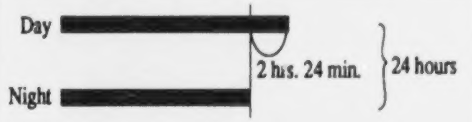

Figure 2: Visual for Wasazan

Tsurukamezan (Crane-turtle Problem)

There are 24 heads and 60 legs of cranes and turtles combined. How many cranes and how many turtles are there?

If all heads are cranes' heads, there would have been only 48 legs. There are 12 more legs because of some turtles that have 2 more legs than cranes. In Figure 3, the shaded area indicates the number of total legs.

This is not merely a problem of finding the speed because the train is not just passing a point but passing an object which has some length (i.e., bridge, tunnel, platform, etc.).

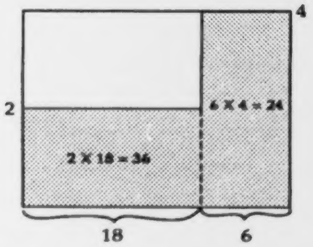

Figure 3: Visual for Tsurukamezan

Tsukazan (Passing Problem)

> **It took 10 seconds for an 80-meter train to pass through the 300-meter bridge. What was the speed of the train?**

Drawing a visual shown in Figure 4 may avoid the confusion between this type of problem and the ones in which the train passes a point.

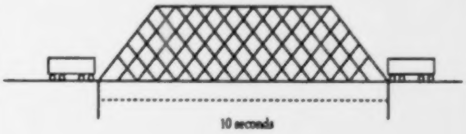

Figure 4: Visual for Tsukazan

Uekizan (Plant Problem)

> **Hanako wants to plant flower seeds along the street between her house and Taro's house, of which the distance is 105 meters. If she plants 20 seeds, what is the interval between seeds?**

The number of seeds does not agree with the number of intervals as shown in Figure 5 because the base on which the seeds are planted is a line rather than a circle.

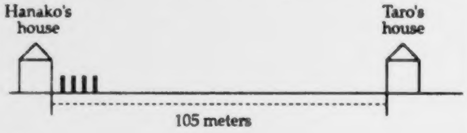

Figure 5: Visual for Uekizan

Conclusion

Japan, being known to have produced one of the highest literacy and numerical competences in the world, its educational system has long been analyzed by educators and anthropologists in various literatures. Criticisms often focus on the pressure and the stress of the children toward competitive entrance examinations that expect too much of rote memory learning (Duke, 1986; White,1987). On the contrary, Japanese education, even at elementary schools, has been promoting to teach mathematical problem solving. This can be evidenced in the analysis of the content of entrance examinations of arithmetics for junior high schools.

Through promoting visual thinking, very abstract process of mathematics may be understood by a child who has not reached the formal operation stage. It could be applied to individuals of any nationality at any age level, though it is a practice seen at the primary education level in Japan.

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Investigating Visual Literacy: Developing Skills Across the Curriculum

Rhonda S. Robinson

In our over twenty year long quest to "discover" visual literacy, we have worked to develop definitions, conduct research, explore theory, and design practice which would impact the educational world. Our search for methods to improve the understanding and use of visuals in educational materials has lead us to research in perception, picture types, illustration, motion media, visual language, and communications. More recently, research and development efforts have centered around the newest technology, the microcomputer, and its many related facets of screen design and multimedia applications.

At the same time, we have also concentrated on developing successful methods of teaching visual literacy to others, and we have designed many materials for the classroom and beyond to assist in that effort. This paper will briefly introduce the background of visual literacy and will provide an introduction to the philosophy of integration of visual literacy into the classroom. The papers which follow it provide examples of classroom-based activities which introduce visual literacy to K-12 students in this integrated approach.

For twenty years, our field has been struggling to discover the definition of visual literacy, and its many component areas. We have made great progress towards reaching consensus on the definition of visual skills leading to literacy (Clark-Baca and Braden, 1990). Using an involved Delphi process, Clark Baca determined, for instance, that our definition of visual literacy includes at least 19 statements of agreement, including concepts, elements, and constructs of visual literacy such as terms, designs, and uses. We have agreed on the importance of these skills, and we now strive to develop and promote the inclusion of visual literacy in school curricula and activities, in many ways.

Additionally, while progress has been made towards a definition, many researchers have been investigating visual literacy in an attempt to discover aspects of the component areas that can contribute to teaching and learning. Visual literacy and media literacy have been the focus of many types of research in several different fields. Investigations in mass communication, perception, special education, educational technology, media production, text design, and even computer aided instruction have been concerned with specific areas of visual literacy research.

These areas include a wide variety of research types and agendas. Dwyer (1974 and 1984) has focused research on the effectiveness of picture types and detail of illustration as they relate to enhanced learning from pictures. Dwyer's work has been often cited and has given educators and text designers several guidelines to consider in planning instructional use of visual material, and visualizing the testing of concepts gained.

Others have used this effectiveness literature to investigate text illustration and CRT text design (Grabinger, 1984; Alesandrini, 1985). The development of guidelines for the design of text and computer screens has progressed, but more work needs to continue. One major concern is the translation of such guidelines to those actually programming learning materials, as they often may not be educators.

Another focus area has been the motion media, television and film. The production, the messages, and the effects of media have been investigated (DeGraff, 1985; DeVaney, 1990). The actual "text" of visual media has been observed, delineated, and categorized, and the possible effects of this coding has been suggested.

Educational communications research on the effects of television has focused on learning patterns, knowledge of reality/fantasy, special effects and commercial messages, and televised violence (Chaffee and Singer, 1981).

In addition, researchers have investigated perceptual development, the effect of pictures on reading comprehension, and the most effective uses of computer-generated illustration and text. Over the twenty years of research, many questions have been raised and only some have been satisfactorily answered. We continue the "search for solutions."

The translation of this research to curricular development has taken place throughout the last twenty years as well. In the past 10 years or more, research results have been followed and many materials have been created and published which attempt to teach a wide variety of visual literacy competencies. These materials, books, teacher guides, visual media, and more, have been extremely helpful in guiding teachers in the instruction of visual literacy. (See Esdale and Robinson, 1982 for excellent list.)

Towards the solution of our visual mystery, one of the biggest deterrents to the inclusion of visual literacy development in school curricula has been the question of appropriate "fit". Where does visual literacy "belong" in the school curriculum? The many areas of visual literacy, and its many definitions, have led to its being considered part of many different areas, but not necessary to any one area. Art courses seem the most natural "fit", and visual literacy does naturally fit there. However, visual literacy development also can be a part of language and literacy curricula, and so just as easily "fits" into Language Arts and English courses. In addition, other educators are finding that problem solving, communications, world cultures, and even computer literacy are also impacted by visual literacy development. Consequently, the concepts of visual literacy could "belong" as well in math, social science, and computer courses.

As all this indicates, there is not just one perfect "fit" for visual literacy in any curricula. The quest for visual literacy development must take many clues and must combine diverse information from research and theory to solve the mystery of where it should be found in school curses (I mean courses).

One very well established theory for curricular development and visual literacy is the integration theory (Esdale and Robinson, 1982). This holds that visual literacy skills and concepts have no one place in school curricula; that no one area is best for the development of skills. Instead, visual literacy should be integrated across all curricular areas in an effort to both expand ability and to prevent categorization which could limit learning and use of visual literacy skills.

Integration of visual literacy into all of the typical school subject areas prevents the limitation of skill development that can occur by considering all the related skills in just one course or subject. If students are encouraged to practice, develop, and use visual skills in a wide variety of course settings, they will both develop the skills more easily and use them more often in learning.

This can be illustrated by many examples. The group of papers presented in this session (Bazeli, Dana, Fister, and Rusevic) provide proof for classes in math, computer literacy, and elementary and secondary language arts. However, one further example will be magnified here. Many schools consider visual literacy along with verbal literacy, and the visual skills are introduced through the language arts concepts already in the curriculum. (See Esdale and Robinson, 1982, for further details.) In this way, visual literacy is developed along with verbal literacy, in such areas as language use, literature study, communications skills, and writing skills development. Research skills, poetry, creative writing, listening skills, and so on can all be developed and practiced along with visual literacy skills.

As an illustration, one way to develop a language arts-based visual literacy program is to add *viewing* as a language art, along with reading, writing, listening, and speaking. Since many school districts already have written curricula in place, with objectives and suggested activities delineated, the addition of viewing is quite simple. The two pages of illustrations at the end of this article show one such curricular addition, with objectives and suggested activities described.

This integrated approach makes learning easier, and more logical for students. In addition, visual skills are integrated in such a way as to make them important without making them different. In other words, the development of language arts skills includes visual literacy as a language arts skill, not as a separate area to be called upon only when "visuals" are being studied.

The integration of visual literacy into a variety of curricular areas can easily be planned and executed. Visual literacy development can help in the learning of many skill areas: organization, interpretation, evaluation, writing, reading, speaking, listening, and creativity can all be developed through the use of visual literacy activities. These are skill areas required in many areas, and can aid students in all areas of the curriculum.

While many educators can see the links between art and visual literacy, or language arts and visual literacy, it may be more difficult to see the link between math or social science and the development of visual skills. The course in visual literacy at N.I.U., like many others, includes a unit in the teaching of visual literacy in school subject areas, and encourages students to develop their own teaching units for grades K-12. Many students who complete this assignment create their own original curricular materials based upon the tenets of visual literacy. The activities they design call upon the development of thinking skills, observing skills, problem solving skills and computer skills. In addition, the activities focus student attention on the importance of integrating visual literacy development in all areas of school curricula. Rather than limiting visual literacy by categorizing it into one subject, teachers and students are encouraged to broaden their thinking and their skill development by including visual skill development across the curriculum.

Where is visual literacy? How can we solve the mystery of integrating visual literacy into school curricular areas? It is hoped that this introduction and the papers that follow help provide clues to the solution of the mystery.

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PART 2: THE SYSTEM OF LANGUAGE

Concept Related to Viewing:

Meaning is transmitted through a sound system

(speech and a symbol system (graphic).

--p. 12.

Skills - Grade 7

- Recognizing relationships between oral and written language conventions:
  - a) representing speech sounds as written symbols
  - b) identifying similarities and differences between spoken and written language.

Suggested Viewing Activities:

Ask students to name words which spell a sound or which are spelled like the sound they represent (e.g., hoot, rustle, cheep, plunk).

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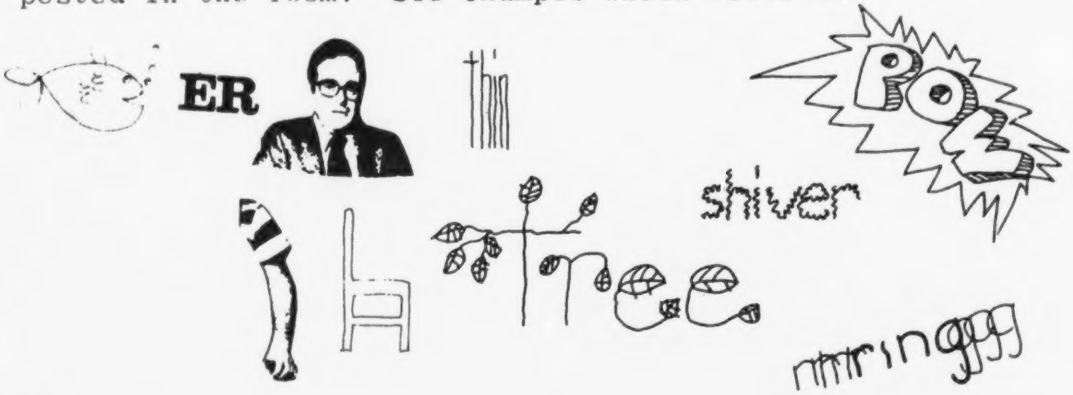
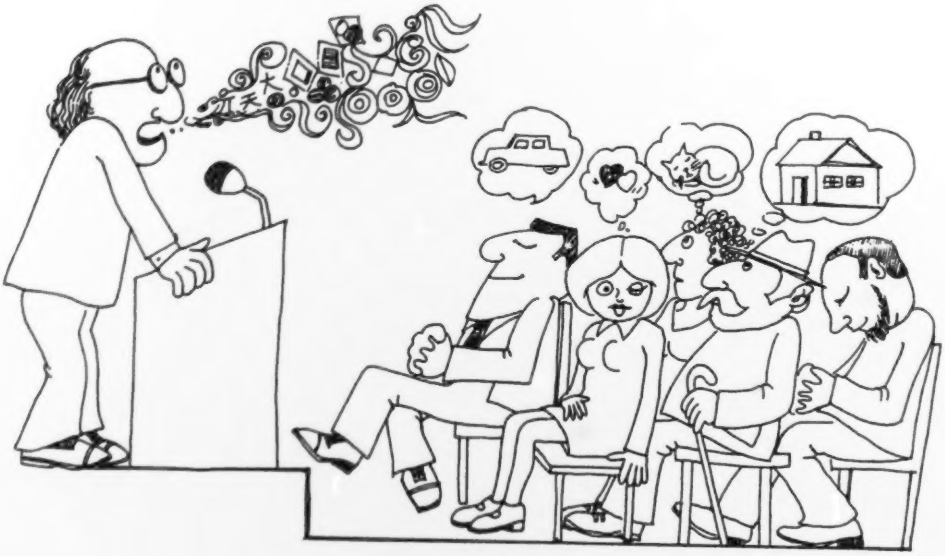
Give students sheets of colored paper. Have them write words that communicate visually. These can be posted in the room. See example which follows.



From Hands On by Anne Taylor. National Film Board of Canada, 1977. Distributed in Canada by Gage Publishing Ltd.

Esdale and Robinson, 1982, p. 22.

Have the students find pictures or cartoons (such as the one which follows) in which there are no words. By examining the body language and the symbols in the picture balloons, have students write a representative comment for each of the five audience members.



These two pages, taken from Esdale and Robinson, Viewing in Secondary Langugae Arts, show concepts, skills, and related activities integrating visuals into language study.

Esdale and Robinson, 1982, p. 24.

Techniques and Activities in Visualizing Concepts in the Elementary Classroom

Ann Popple

Visualizing Concepts in the Elementary Classroom

In undertaking this paper, one of the first tasks was to decide what I consider visualizing concepts to be. This is a prerequisite because the process by which we visualize concepts has been so variously described. True creative visualization for conceptualization in classroom situations fulfills at least three conditions. First, free-associative thinking facilitates random thinking. Develop a plan of action for implementing additional ideas about a situation. Lastly, take a calculated risk based on information gathered about a situation.

Visualization from this point of view is a process of structural attempts in order to gain a differential perspective taking. In other words, developing individual, diverse patterns of thinking schemes, characterized by developing thinking powers, openness, and rearranging ideas.

Creative is the dominant trait that describes my personal learning and thinking style. Of equal importance is the belief that I am a predominantly visual learner and thinker. I conceptualize ideas and visions before linear type ideas surface. A penchant for thinking in this manner has provided me with ways to foster existing teaching talents, in turn fostering existing thinking talents in the students I collaborate with.

In essence, visualization is creating a particular concept, a specific picture in one's mind. Given this premise is accepted, a creative mode of thinking is a necessity in order for visualization to become a cognizant activity for the learner. Therefore, an important distinction between 'visualizing' and 'being visual' exists. Visualizing can be seen largely as a passive, information gathering phase; one of warming up to the fire. The learner is primarily in a proactive mode as the process of creating visually enables him/her to gain different perspectives on the particular situation; hence the learner is creating the fire.

Creating the fire is gaining recognition as an effective methodology in school districts across the country. Creative problem-solving is an important survival skill, a must for kids to develop in a rapidly changing society (Toffler, 1980; Torrance, 1976). Ellen McGrath, cognitive psychologist at New York University, complements this premise by echoing that the survival skill of the '90's is creativity. Albert Einstein told us sixty years ago that imagination is more important than knowledge.

In its entirety, visualizing concepts in the elementary classroom is the resolution of taking calculated risks, and allowing students an environment to profit from those risks rather than being a haphazard, go with whatever happens notion.

Techniques in Visualizing Concepts

Techniques need to be considered with kid gloves because a single approach of visualizing concepts will reach only a certain population of students. Technique implies an orderly arrangement of ideas which seems to be paradoxical to the notion that the goal of visualizing concepts is unique to the learner. However, techniques provide starting places. Absence of a technique becomes the technique chosen.

Some things to keep in mind: There are several techniques that work effectively, have stood the test of time, and some that are currently in vogue. Techniques vary to degrees of experience level of teacher and students. What works best for me is to consider several techniques, and anticipate the compatibility of method with the group of students as well as the individual. Introduce the techniques to the students and get some feedback from them.

The purpose of presenting the following techniques is to suggest, a possible route to travel. Apply the techniques in your own way.

Teaching Acronyms

* Personal acronyms allow the student to develop an acronym to describe individual visualization processing. For example, "SISTER" Start thinking of different ways to look at the situation; Ideas, think of as many ideas as humanly possible; Say the problem aloud; Take the ideas you happen to like best; Evaluate the ideas against various criteria; Return to the proposed idea after a few days.

* Display acronyms around the room. Modify as frequently as possible.

Celebrate Failure

* Demonstrate situations that require failure in order to succeed. Invite students to generate situations. For example, Tom Edison had repeated attempts before his invention "caught fire."

* Distinguish between degrees of failure.

* Create scripts for familiar concepts such as adding numerals, reading a paragraph to gain understanding, going to a restaurant, etc.

* Reorganize script to identify new questions to grapple with.

* How does confronting new questions relate to learning?

Visiting the Twilight Zone

* Show a "safe" MTV video. Lead students into making the connection between story of the song and artists visualization of the idea behind the song.

* Play the song again and have the students compose a different vision for the song.

* Once comfortable with visualizing with music, have students tackle different situations set to music. For example, using music without lyrics to create a story line, meditate on a conceptual situation, or reorganizing a situation to generate new ideas.

Computers

* Computers are less of a threat to students' inference making processes. Computers are objective.

* Utilize computer programs that revolve around open-ended questions.

* Students speculate, imagine responses to plug in.

* Computer provides counter-example from data base.

* Student then rearranges inferences and the cycle continues.

* Interactive computer programs creative

an interdependent feedback dynamic for visualizing concepts.

Listen

* Seemingly an odd technique, yet an effective one indeed. Listening is important because it is one representation of intelligence.

* In order to conceptualize, one must be reacting to something, therefore, the first place to begin with is one's own mind or voice.

* Secondly, listening to someone is a skill of listening to what is being said as well as what is not being said.

* The mind needs data to work with; allow data to be processed.

Techniques of Techniques

* Techniques surface as the dynamics unfold in the classroom in which you are teaching.

* Try writing down ideas as soon as they pop into your mind.

* Videotape a lesson in visualizing concepts and view later to critique and generate new ideas.

* Share ideas with colleagues.

* Read the literature on this topic.

* Start a newsletter.

* I'm convinced there are at least 989,000 other techniques that haven't been mentioned here.

Activities

These activities have been added from several sources and can serve as a springboard of ideas to influence the students' processes of visualizing concepts. The first activity tends to promote interest in the entire area of visualizing concepts.

Hook'em

* Before using this method, ensure that every student has experience with taste bud sensations by conducting "taste bud reaction" experiments.

* Create in your mind a visual image of a ripe, yellow, plump lemon squirting juice into your mouth and onto your tongue.

* Solicit responses from students, successful images will cause a person to actually salivate.

* Since imagery clearly has the potential to effect the nervous system, then what happens when you think of other situations that cause similar reactions?

* Generate other images that demonstrate the power of visualizing, such as thoughts that produce "goose bumps" or "a state of total relaxation."

Similies in Writing

* Provide examples of similies; group generates examples.

* Discover their utility in writing and conveying meaning.

* Visualize comparisons.

* Write or draw imagined similies.

Affective Dimensions

* Set up problem situation, class, teacher, or both.

* Imagine the event, discus what you see.

* Generate a list of images.

* In groups, pairs, or individual, arrange images sharing similar attributes. Allow students to set criteria for categorizing.

* Let situation rest for a few days and point out ways in which students can observe situations that resemble the original problem.

* Discuss different situations from previous one and categorize and discuss again.

In Search of Main Concept

* Pick out the main-idea from a newspaper or magazine article. Write it down.

* Generate list of main concepts.

* Compare list, the ideas probably are inter-related.

* Repeat the activity often so it becomes routine.

* Render individual interpretations, explanations, and rationales for main-concepts.

* Apply various main ideas to new situations, how does point of view influence application? For example, when inventing a device to see better, for some students the main concept is "creating a synthetic eye," others may be to "develop a superior eye."

Why?

* Typically, an asked question to evoke additional information. In this activity, perplexity is the function of the explanation; because begs the question.

* A questioning statement is made by the initiator and the respondent asks "why? followed by a focusing statement. For example, "Why are we required to learn Math?" "So that we can perform a variety of functions in society such as problem solving." Why would it matter if we didn't know how to solve problems?" Because we would be in a state of confusion otherwise." Why does Math help keep us out of a state of confusion? And so on.

* The initiator can at any time say, "I'm not sure. Why do you think?" If the respondent gives an answer, then reverse the roles.

Associate It

* According to the theory of Piaget, we tend to associate new concepts with similar existing ones. When visualizing new concepts, this activity asks three questions: 1) What goes with A?, 2) What would go inside that A?, and 3) What would the A go in?

* Concepts can remind us of other concepts, and we can also think of specific aspects that remind us of other specific aspects. Taking it a step further, concepts can remind us of specific aspects and vice versa. The point is that we generally do not break out of the pattern of association, and therefore, these questions will cause new concepts to come to mind.

Scrap the Patterns

* We have a warehouse full of general information derived from our experiences. We also have ways of explaining various concepts based on this warehouse of information.

* Provide an open-ended conceptual situation and elicit explanations from students.

* Attempt to explain as if matters were different, even fictional.

* Break out of the pattern of rational, logical thinking.

* Modify the "fictional" explanation to the original one.

* Explaining something means thinking about it.

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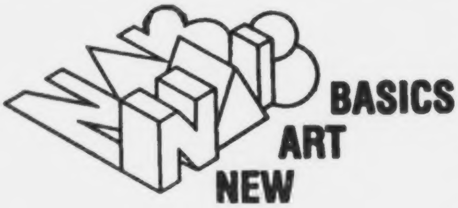
New Art Basics: A Visual Approach to Visual Creativity

Dennis Dake

New Art Basics

The most widely known statement about visual literacy, formulated by Debes and Williams, refers to a group of vision competencies and states that "through the creative use of these competencies, (the human being) is able to communicate with others". This ability, in a verbally based culture such as ours, requires an educational system that actively promotes the development and enhancement of skills in visual creativity. In order to develop accountable methods for developing and promoting this important visual literacy skill, Iowa State University faculty Dennis Dake and John Weinkein have, over the past four years, developed a cooperative applied research arrangement with 73 Iowa public schools,a project called New Art Basics (NAB). The primary goal of the project is to create a new approach to visual creativity through art education.



History of Project

The New Art Basics project began in the summer of 1986 with 13 dedicated and enthusiastic art teachers from throughout the state of Iowa. Each school district represented in the project purchased a share in the project and guaranteed support for its art teacher's continuing participation. That first summer the original group of teachers compiled a loose leaf notebook of over 300 original instructional strategy plans for testing in their classrooms, K-12. The enthusiasm of the original participants, based on perceived real successes with children, has been communicated to art education colleagues across the state, and in the subsequent 4 summer workshops Iowa State University faculty have trained 60 additional teachers in the NAB approach to visual creativity. Two research grants from the Iowa Department of Education have, in the last two years, allowed the project to expand its operating base, create a statewide personal computer based telecommunications system for all participants, and integrate all preservice art education students into the project. The project now has 800+ original teaching strategies designed by the participant teachers.

Structure of the Project

The New Art Basics project as currently operational is a multi-faceted approach to the reform and revitalization of visual education. It contains educational components which are aimed at:

- **Curriculum reform**
- **Staff development**
- **Teacher education**
- **Technological education**

Curriculum reform

The New Art Basics is a curriculum development project designed in response to calls for change and improvement in the field of art education. The NAB approach is to network art teachers across school district lines and make it possible for them to work cooperatively to update curricular content through careful incorporation of new knowledge about the discipline that underlies the practice of creating visual art. There is a great deal of knowledge about what is basic to the production and literate appreciation of the visual communication that has never been adapted for use in public school art programs. Included in this project is the current knowledge of visual and creative thinking, graphic ideation, multicultural/ non-sexist education and the indepth study of art history. The NAB project brings a new approach to updating the curricula and methodology of art education by incorporating this knowledge into a format cooperatively developed between university art education faculty and classroom art teachers. Beginning with a foundation of studio production activities, NAB integrates aesthetics, art criticism and art history within a teacher's existing curricula. Higher order thinking skills, communication skills and general learning skills are addressed by all the teaching

New Art Basics is classroom based educational research

strategies of the seven NAB content areas. The process of visual creativity is also seen in relationship to its human, cultural and historic contexts. All the teacher/researchers participating in the project are continually designing and testing hundreds of unique and original teaching strategies. Only classroom activities which are teacher designed and proven effective in classroom testing are included in the on-going curriculum. The strategies are organized flexibly in a practical curriculum which teachers really use.

Staff development

The New Art Basics project is a system for empowering and revitalizing art teachers. Teachers from many school districts have banded together to create a network which allows them to break out of the academic isolation imposed upon them by artificial geographic and bureaucratic boundries, and to expand their professional dialogue and participate in cooperative sharing with other art educators. This method for helping teachers grow and change in a fully supportive environment, is called the Cooperative Empowerment Model. The NAB project has placed a premium on connecting art teachers with each other, with university faculty, and with new ideas on how to promote visual creativity. Because all strategies entered into the curriculum are coordinated with state standards and guidelines, NAB aids teachers in their increased need for accountability as well. Four continuing in-service meetings each year, at Iowa State University, provide the time for sharing valuable common lessons, experiences and goals. The project empowers participating teachers to utilize their own creativity and organizational skills to broaden their roles and become visual learning specialists in their local schools.

Teacher education

Professional teacher organizations have long asked that classroom teachers have more input into teacher education. New Art Basics is leading the way to make this happen by integrating the preservice art education program at Iowa State University with the on-going research and curriculum development project among master experienced teach-

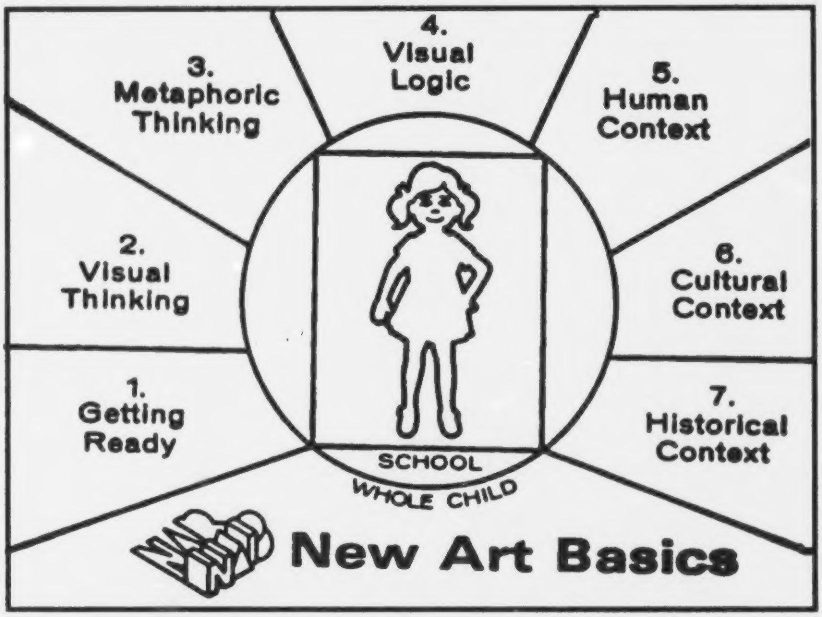
Cooperating art teacher and student teacher using the NAB statewide computer network

ers. Initiation of this state of the art approach to teacher education is made possible by competitive grants for demonstrating innovative methods of teacher education and certification from the Iowa Department of Education.

Each art education major at Iowa State is provided with a mentoring relationship to an experienced NAB teacher/researcher during undergraduate years. Students attend in-service meetings with their mentors and assist in the on-going classroom research. Future art educators also have access to the experience and knowledge of master teachers through participation in the computer network. This participation provides for unique university methods instruction, closely related to the world of practice and a supportive student teaching experience in an innovative NAB school at the conclusion of the college years. It has proven to be an extremely effective introduction to the teaching profession.

Technological education

The New Art Basics project operates a state-wide computer network for participating art educators. Each NAB participant has access to a state-of-the-art computer connection with all other researchers in the program. The teacher/researcher is able to share continuously, from his/her own school building, hundreds of new innovative teaching ideas and resources through, electronic mail, several bulletin boards, indexes and data bases created specifically for the project. Communication is also available on the computer network with university faculty, consultants, graduate research assistants and other project staff at Iowa State University. All student teaching at Iowa State is conducted in NAB schools, and student teachers are in continual telecommunications contact with the university. other student teachers and the project as a whole. Individualized, formative evaluation of all student teachers is conducted



Structure of the New Art Basics "Natural Birthright" Curriculum over the computer network and shared regularly with the aspiring teachers.

Structure of the Curriculum

All the 800 + visual learning activities currently in the NAB curriculum are organized into seven large groupings. While fairly arbitrary distinctions are made from among the vast body of new knowledge about psychological, sociological, ethnographic and disciplined art studio practice, the seven groupings have been proven to be comprehensive and inclusive enough to contain all the subject matter which teachers are currently required to integrate into art curricula.

1. Getting Ready for Visual Thinking: In this area students are taught the skills of visualization, relaxed attention, part and whole thinking and mental rehearsal skills that are necessary for productive visual thought. During the pilot study, getting ready activities have been shown to result in heightened imaginative skills and greater motivation for art activities.

2. Basics of Visual Thinking: Visual thinking strategies are designed to increase students' ability to think in configurational terms alone, increase both the flexibility and fluidity in the process of generating visual ideas, teach a preference for combinative thoughts and promote reflective thinking about the course of graphic ideation. Activities in this area have been shown to promote joyful participation in the formation process rather than product centered activities to please the teacher.

3. Metaphoric Thinking: Strategies in this area teach students the boundary stretching and boundary breaking thinking skills of bisociation and analogy. To see connections where others have not is a productive thinking skill of great creative importance and one that is uniquely suited to visual instruction.

4. Visual Logic: A developed internal sense of cohesiveness, comprehensibility, internal integrity and elegance is necessary to guide original thinkers to a sense of completion and understanding. Strategies in the visual logic area teach students to understand the normal functions of their perceptual system as the basis for developing visually logical designs, designs that "work."

5. Human Context: This area teaches children the important functions of art such as recording experience, communicating information, renewing life and providing continuity. All of the studio based activities in this area contribute to the sense of art created as an inner necessity so basic for human development and socialization.

6. Cultural Context: Activities in this area are designed to speak to our group identity through ritual ceremony and celebration. They teach that in many cultures of the world, art is perceived as central to life, no designation separates it artifically from the rest of life. Rather than meaningless projects completed for course requirements, cultural context strategies seek to make students aware of the "glue" that binds a culture together.

7. Historical Context: Strategies in this area better prepare students for understanding where they come from, how they got there and where they are going. The effect of the study of history is to em-

power the living. Lecture methods are replaced by art production activities with reflective thinking components that require students to study the visual, material record left by those who have preceded us.

The New Art Basics project has two emphases that give it a unique approach to creativity based in visual learning: 1.Graphic Ideation, the generation of visual ideas and 2. Relational and Contextual Thinking, approaching visual communication with more than linear reasoning.

Emphasis on Graphic Ideation

The ability to produce unique visual forms of communication has both an internal and external component. The internal component is called visualization: the ability to form a mental image in the mind's eye. The external component is the visual thinking contained in the sketches, preparatory studies and early versions of a visual idea.

The New Art Basics curriculum has both original directed and receptive visualization activities. Students are taught to let mental imagery form first in their minds, with full understanding and verbal explanation postponed until the visual configuration is tentatively recorded in visable form. One such visualization activity is a strategy called slow motion tropical jungle. In this exercise the students are lead on an imaginary trip to a steaming tropical rain forest where they visualize the environment in all sensory dimensions. At the conclusion of the script reading they are asked to record, as best they can, the image they formed in their own mind.

Recording an initial image enters the visual idea in formation into the exterior realm of visual form where it can be manipulated and shaped into a refined visual message. This evolutionary process of making tentative "thumbnail" versions, reacting to them, modifying them, and refining them is an extremely

NAB Teacher reading "Slow Motion Jungle" visualization script

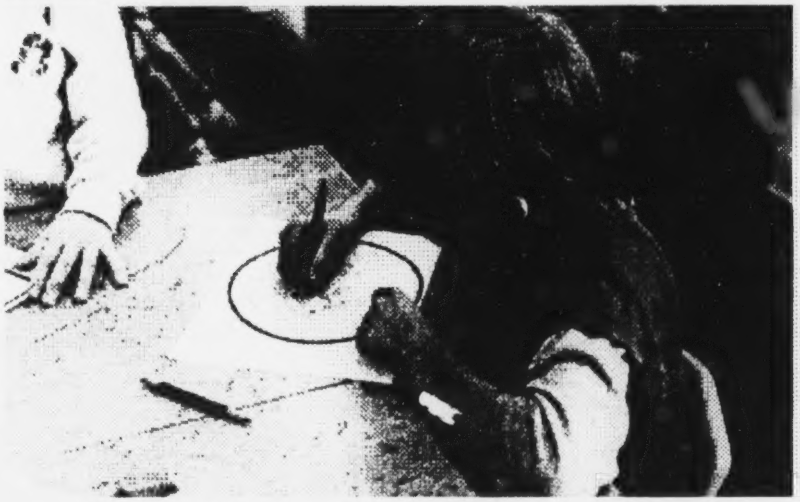
valuable disciplined focus for the student conditioned to a schooling world based on closure on quickly formed final answers. The importance of the formation process is emphasized by the following quote from the diaries of the artist Paul Klee.

"Form must on no account ever be considered as something to be got over with, as a result, as an end but rather as genesis, growth, essence. Form as semblance is an evil and dangerous spectre. What is good is form as movement, as action, as active form. What is bad is form as immobility, as an end, as something that has been tolerated and got rid of. What is good is form-giving. What is bad is form. Form is the end, death. Form-giving is movement, action. Form giving is life."

Recentering Grid visual thinking strategy

Two activities designed to promote the evolutionary development of visual form are Recentering Grid and Visual Thinking like a Group. Each of these activities focuses on specific higher order thinking skills which give students an opportunity to practice disciplined action with individual interpretation. The first, named Recentering Grid, asks students to create a grid of squares on a large sheet of paper. Along two edges of the paper, photographs of various objects are placed with separate domains such as animals and mechanical objects along each edge. In the remaining blank spaces on the page students must combine some element of the photographs on either end of the columns leading horizontally and vertically from that square. A great deal of original and novel visual experimentation is thus encouraged.

The second activity submitted as an example of graphic ideation is titled, Think like a Group. This activity is designed as a cooperative learning strategy. Students are asked to contribute individual visual thoughts on separate 8 x 10 sheets of paper to a group problem solving activity. Each student is encouraged to provide an individual "voice" for creative possibilities. Separate "rounds" of activity ask students to combine possibilities they see in the presented group display and otherwise elaborate on ideas initially presented by other students. Periodic group critical analysis sessions give direction and individual understanding to the activity. The final result is a wall display full of hundreds of visual configurations, many of which have real potential for further individual development.



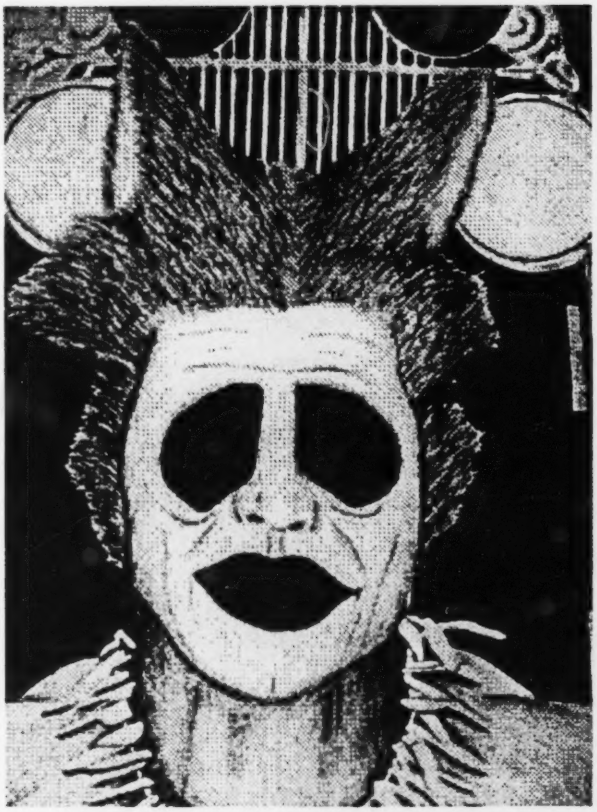
Student working on contribution to Think Like a Group strategy

Stressing Relational and Contextual Thinking

Visual creativity does not proceed by linear logic. Its sense of playfulness and ambigious experimentation can only be understood if the student is taught to think relationally and contextually. The New Art Basics research has discovered that this type of thinking can be very effectively promoted with learning activities in the visual arts. Because all elements in the visual field are seen in relationship to each other and to the entire context in which the work was conceived and produced, these types of learning activities are especially integral to study through the visual arts. Activities that teach metaphoric thinking with analogical rigor and perceptually based activities leading to a sense of visual logic both contribute to the promotion of relational and contextual thinking in students in participating schools.

An example of an NAB metaphoric thinking activity is the strategy titled, A Metaphoric Face. In this learning activity students in small teams are challenged to create a single large portrait from multiple sets of slides projected on top of each other. With each successive overlay of slides, decisions about the visible metaphoric meaning must be discussed and visually rendered as form. A member of each team is assigned to record the decisions that are made to include additional physiognomic features to the portrait and then write a poem to accompany and highlight the meaning of the art work. As the art work and the poem develop they often influence each other in directing the on-going formation activity. Without a predetermined final project in mind this strategy has shown the ability to develop multi level thinking about possible meanings. The activity has further proven to be exceptionally motivating to students who were previously conditioned to an education focused exclusively on convergent, single answers.

In addition to metaphoric thinking, NAB activities that focus on developing an internal sense of visual communication that "works" effectively are represented in the visual logic area. This area promotes taking individual responsibility for one's vision, really seeing the developing

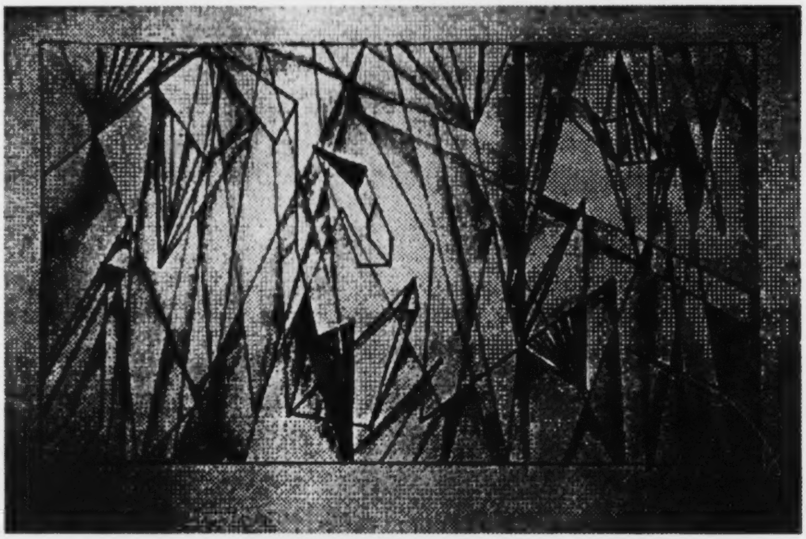


Metaphoric Face strategy (high school level)

visual form in front of the person. The NAB strategy titled, Avoid the Dot, has proven especially successful in developing this sense of visual logic. Each student is given a printed format with subsequently larger printed dots near each corner, the middle of each side and the center of the space. The only instruction to the student is to create any visual form they wish within this format but to "avoid touching every dot". From lower elementary through college level instruction this strategy has demonstrated convincingly that it leads to visual communication that is more effective.

Conclusion

The philosophy behind the New Art Basics project maintains that each human being has the natural right from birth to effective visual language. While the cultural conditioning each human being receives leads to a superimposition of the verbal over the visual, the NAB project has demonstrated that this natural birthright of visual communication can be recaptured and further developed. Developed visual creativity skills are necessary for invention in other disciplines beyond art, such as science. Therefore, the issue of whether art can be more basic in the educational agenda of the public schools is



Avoid the Dot strategy (5th grade student's example) being addressed by the NAB project. The New Art Basics project finds that a shift away from production based art education will have positive influences on nearly every student taught. Through hands on teaching that is learner centered, NAB is making a difference in thousands of students' lives.

Continuation of this research is projected through on-going cooperative efforts such as lectures by nationally known speakers, seminars on visual and creative thinking, multicultural events, further workshops and long-term curricular development projects. New Art Basics will continue to encourage and stimulate further cooperative efforts between Iowa State University and the research participants to enhance visual literacy in Iowa children. This project is making visual education more basic to the educational agenda of the state of Iowa, the region and the nation.

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NAB Mime Troop which gives wordless art workshops

Design Education's Role in the Quest For Visual Literacy: Learning Through Design

Ann C. Saunders

Visual literacy advocates do not need to be told there is a plethora of visual information and much of that information is 'by design'. However, they need to be aware of the allies they have in design educators. They also need to be aware that design education is another means for advancing visual literacy.

Design and design educator Caroline Hightower tells us:

> Graphic design is an ubiquitous presence in our daily lives that can engage and inform us or simply add to the visual morass of contemporary culture. Important and unimportant messages are graphically communicated throughout the day. From the face of the clock that wakes us, the morning newspaper and the subway or expressway signs on our way to work, to the weather map on the evening news and the preparation of dinner, graphics are a constant in the lives of a captive audience unaware that the profession of graphic design exists and that quality can be of consequence.[1]

Author and educator Stuart Ewen in a recent public television broadcast[2] stated:

> From very early on, students need to be educated into the idea that images speak, that images say certain kinds of things, that there are values and priorities and meaning embedded in images, and that they need to learn something about the vocabulary and grammar of images to be critical, to do critical readings.

He goes on to say, ". . . the value of making visual literacy a basic part of education is it will take materials which are primarily directed at the emotions and senses, and reposition them within the region of reason and critical thought."

In the same program Bill Moyers stated, "Unless we (the public) learn to analyze and understand this new visual environment others will do it for us and leave use with no role in the life of this nation but consuming images."

At a time when more information exists and when much of the information "seen" becomes the rationale behind a decision, change or maintenance of the status quo, "reading" the objects, symbols and images around us is of critical importance. We must understand how design contributes to the visual information we encounter.

To "read" design as information requires skills that most outside of the design professions, and certainly those who are visually illiterate, do not possess. This paper focuses on design activity and education as a structure and framework for developing the visual literacy skills and competencies needed to accomplish "reading" and making use of visual information. Design activity represents speculation and the process of making use of information, putting it to work, exploring and actualizing its possibilities. Design activities are a fundamental aspect of design education. The author suggest the learning experience is optimized when using design processes for resolving problems or projects. These problems or projects will from here on be referred to as design activities. Finally, the author suggests the important role the design educator can play in the research and development of visual information analysis and educational program to contribute to the visual literacy effort.

Richard Sinatra explains visual literacy as "the active reconstruction of past visual experiences with incoming visual messages to obtain meaning."[3] He also states that because visual literacy emanates from a non-verbal core, it becomes the basic literacy in the thought process of comprehending and composing that underlie reading and writing.

> Roger Fransecky and John Debes further define visual literacy as:
> a group of vision competencies a human being can develop by seeing and at the same time having and integrating other sensory experiences. The development of these competencies is fundamental to normal human learning. When developed they enable a visually literate person to discriminate and interpret the visible actions, objects, and symbols natural or man-made, that he encounters in his environment. Through the creative use of these competencies, he is able to communicate with others. Through the appreciative use of these competencies, he is able to comprehend and enjoy the masterworks of visual communications.[4]

The development and creative and appreciative uses of the competencies referred to by Fransecky and Debes are fundamental requirements of students pursuing a design education. Additionally, they are the aim of the 'Learning Through Design' ('LTD') project. The 'LTD' project supports a curriculum concept for general education which advocates the need for visual literacy in the general public, especially in the areas of design, technology and media. The 'LTD' curriculum concept suggests that using design activities in the classroom and developing design awareness in the general public will develop in them the vision competencies as well as the critical, creative and visual thinking skills necessary for visual literacy, and for meeting the challenges of the Information Age.

The following objectives and outcome measures are fundamental to a design education and to the 'LTD' curriculum concept. The objectives and outcome measures require the learner to:

1. gain insight into differences and links between the creative and analytical thought processes including imagining or visualizing, allowing for ideas to germinate or incubate, recording ideas generated when problem solving and planning;
2. demonstrate increased cognitive and sensory skills;
3. demonstrate increased visual awareness and increased creative and critical thinking, using skills gained through cognitive and sensory development;
4. demonstrate increased ability in visual thinking through visual ideation exercises;
5. demonstrate an understanding of the complementary relationship between the written language (including pictorial graphic language), spoken language, and culture-bound conventions;
6. demonstrate an understanding of the relationship between graphic information and the delivery systems through which they are shared;
7. demonstrate an understanding of how the world of graphic form and composition is different from our perception of the natural environment;
8. understand the role of basic design elements and principles, and their relationship to visible language, visual information, and the visualizing or imagining process;

9. distinguish among the various forms of graphic information including symbols, maps, graphs, diagrams, illustrations, photos (still moving), models, and graphic indicators;
10. distinguish and identify the various functions of visual information;
11. identify various visual forms by name; and
12. accurately interpret and derive meaning from various graphic forms of design.

With such objectives, the 'LTD' curriculum concept is a means of developing not only visual literacy but also what Roger W. Sperry[5] identifies as right hemisphere brain function, what Betty Edwards calls R-Mode or "Visual, Spatial, Relational Thinking,"[6] and what Ned Hermann refers to as the "whole brain."[7] 'LTD' thus provides opportunities for experiencing the integration and amelioration of left hemisphere (linear, logical, language-based thinking) and right hemisphere cognition so that, as Ronald Schmeck suggests, students can both remember facts and figures and recognize how those facts and figures relate and connect to other concepts and ideas for which the relationships are not immediately apparent.[8]

Recently, design educators and theorists have recognized a need for the general public to better understand and use design in order to comprehend the "made" world of products, environments, systems and communications. It is because of this need and because design education fosters visual literacy that researchers and theorists involved in design education should unite their efforts with the efforts of visual literacy advocates.

As individuals well aware of the processes, principles, elements and forms intrinsic to the development of visual information, design educators clearly can play an important role in advancing visual literacy. This role complements the role of the visual literacy advocate. The design educator may provide help in defining, articulating, developing, analyzing and contributing to the body of research concerning visual information. This contribution should strengthen the position of the visual literacy advocate and thus contribute to the world wide visual literacy effort.

Research in Network TV News and Its Link to Visual Literacy

My own research efforts in behalf of visual literacy cover the use of graphics in network TV news. It occurred to me that if I could prove the significance and function of graphics in TV network news, I could begin to suggest a public need for visually literacy as well as the need for public design awareness, and critical thinking skills. 'The Role of Graphics in Network TV News Study' was an interdisciplinary study I conducted with Joe S. Foote, Chairman of the Radio and Television Department at Southern Illinois University at Carbondale.[9] The study took a quantitative and comparative look at the role of graphics in network TV news, in the United States.

For the study we gathered data on those graphic forms identified as symbols or symbolic typography, illustrations, still photos, film or videos if they include special effects (video footage without special effects were not included unless they were confined to a chroma keyed area), maps, graphs, diagrams, graphic devices such as arrows and dingbats which are used for pointing to or highlighting, and finally composite graphics which are combinations of any of the forms previously mentioned.

With the assistance of coders, who prior to coding, were worked with in order to develop their visual literacy (critical viewing skills), the three major network were analyzed over a three month period. During that time nine dates were selected at random for coding. Coders were required to distinguish and identify graphic forms by kind, movement and function. As a result of this study we were able to establish that 78% of all stories contained some type of graphic coverage. Newscasts used an average of 26 graphics per program. Excluding stories without graphics, approximately 2 graphics were used per story. The study also showed graphics had well defined functions. 41% were used to introduce a story and 32% were used to explain some facet of a story. An example of an introductory graphic would be the use of an illustration of two converging symbols, represented by flags, to introduce a story on a conflict between two countries. An example of an explanatory graphic would be the use of a series of illustrations which represent the various stages of processing and profiting in cocaine, from harvest to street sales.

Once the significance and role of graphic forms were established, I was able to pose the question, how are viewers prepared to distinguish, identify and articulate constructive criticism of these graphic forms, especially in light of the fact that I had to train our otherwise educated coders? Thus, the link between images designed for TV news and visual literacy was made but it also suggested a need. The study suggested the need for public awareness of the design process in constructing visual forms of communications.

This study further suggests new responsibilities for and new ways of perceiving, design education and the design educator's role. Further, it suggests the need for communications, alliances and unified efforts based on a common goal across all disciplines; the goal of optimal education thus insuring visual literacy through the integration of design activities.

An Approach to Addressing the Need

It was because of this research on graphics in network TV news that the The 'Learning Through Design' Project was developed. The project, which includes a national network, plans for an international conference and plans for a national touring exhibition, was established to build communications among various areas which are advocating changes in education to better prepare us to meet the challenges of today and tomorrow. This change should see design activities integrated into the general education curriculum K-8. Additionally, in high schools design education should be a fundamental entitlement alongside mathematics, sciences, language skills, history and geography.

Design activities can help assure a self-reliance based on a confidence in one's creative ability to negotiate, articulate adapt and foster to change by complementing and optimizing current educational practices.

Special groups, programs and projects all over the country are addressing the need for skills which can be gained through design activity and design education. Unfortunately, these programs only influence small numbers of individuals. The 'LTD' project's strategy is to unite the efforts of these special programs and bring together visual and media literacy advocates, architects, planners, industrial and graphic designers, educators, the business community, as well as those involved in the arts, humanities and sciences; anyone concerned with preparing the general public for the challenges of the 21st century and who recognizes the link between human evolution, design and to the "made" world.

More than fifteen years ago Donis A. Dondis stated, "There is no easy way to develop visual literacy, but it is as vital to our teaching of the modern media as reading and writing was to print. It may, indeed, be crucial component of all channels of communication now and in the future."[10] We must see the link between design and the modern media and recognize how important a command of design language and process is to our being visually literate.

British designer and scholar Ken Baynes has spent most of his life making it possible for more people to participate in design and advancing an understanding of the ways in which the environment is imagined, envisioned, realized, and shared. Baynes has devoted considerable effort to the problem of integrating design activity into the K-12 curriculum in England. As a result design activity has been fully integrated throughout the primary and secondary curriculum in Great Britain. It has been in the primary schools in some places in the U.K. for over four years but is only just recently entering secondary schools. We can encourage similar change here; a model already exists.

The purpose of this paper has been to introduce ideas for discussion regarding the importance of design activity and education in the development of visual literacy. The paper presents design activity and education as a stepping stone to acquiring the necessary vision competencies for negotiating the Information Age. In addition, it recommends viewing the design educator as an ally who can make a contribution to understanding visual literacy through communications, research and curriculum development. The paper also suggest that coordinating a national dialogue among visual literacy advocates and design educators can play a crucial role in bringing the issue of 'Learning Through Design' to the attention of policy makers and the public at large, thus advancing our goals for visual literacy.

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6. Ibid, 11

7. Ned Hermann, The Creative Brain (Ned Hermann/Brain Books, 1989), 183

8. Ronald Ray Schmeck, "Strategies and Styles of Learning: An Integration of Varied Perspectives" Learning Strategies and Learning Styles. (New York: Plenum 1988)

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Schema Construction: A Visual Tool for the Organization of Knowledge

Carla Cooper Shaw

Schooled in the education of gifted children, the author, in her own instruction at the secondary and graduate school levels, once focused almost exclusively on the upper levels of Bloom's Cognitive Taxonomy (1956) and exhorted her teacher education students to do the same. However, after conducting research which highlighted the role of knowledge in effective problem solving, the author has come to reconsider Bloom's lower levels. This reconsideration, in turn, has led to an interest in the ways that students represent and organize knowledge, how they construct schemata, defined in the singular by Glaser (1984) as:

> a pedagogical mental structure, one that enables learning by facilitating memory retrieval and the learner's capacity to make inferences on the basis of current knowledge (p. 101).

The process of externalizing these schemata becomes an exercise in visual thinking at Bloom's levels of analysis and synthesis and, once externalized on paper or the blackboard, schemata become visual tools for problem solving.

This paper will outline the research which produced a turning point in the author's thinking about knowledge. It will then provide an introduction to a variety of kinds of schemata, as well as proposing educational applications and citing probable benefits of schema construction as an instructional tool. The paper will conclude by posing related questions for research.

The turning point. As part of her dissertation, the author (Shaw, 1989) conducted a naturalistic inquiry into the problem solving styles of seventh graders using *Where in the World is Carmen Sandiego?,* a computerized detective simulation. After a six week period during which students from mixed ability social studies classes used the program two hours a week, the best and worst problem solvers, or "detectives," were identified on the basis of rank achieved. These students were then observed and interviewed as they played *Carmen* one and two months following the initial six week period of computer use.

In comparing the problem solving styles of best and worst detectives, the investigator found that both groups used similar thinking skills, with the central one being deduction. That is, thinking skills, or process, did not distinguish between the two problem solving styles. However, the efficiency with which students thought deductively was strongly influenced by knowledge -- the amount, as well as its flexibility and accessibility. The investigator hypothesized that the better detectives possessed larger, more highly organized schemata.

Writing from the vantage point of cognitive psychology, Glaser (1984) discusses the role of knowledge as it relates to problem solving, and many of his conclusions corroborate and illuminate the conclusions drawn from the analysis of the current study's data. He says that "a major component of thinking is seen to be the possession of accessible and usable knowledge" (p. 97). The implication is that novices' difficulty in solving problems derives from inadequacies in their knowledge bases, rather than from their processing capabilities. With *Carmen,* all students proved capable of deductive reasoning, but its relative efficiency was strongly influenced by the existence of prior knowledge.

An introduction. If, as Glaser and the findings of this study suggest, knowledge bases of adequate size and organization are prerequisite to effective problem solving, students' development of schemata becomes an instructional priority. Teachers have long recognized this priority as they have used schemata, or graphic organizers, in the classroom under a number of different guises, such as compare and contrast charts, Venn diagrams, flowcharts, step-by-step diagrams, matrices, and concept mapping. While step-by-step diagrams are appropriate for procedural knowledge and flowcharts for conditional knowledge, a number of structures loosely grouped under the rubric, "concept mapping," are relevant to the representation of declarative knowledge. These schemata include hierarchies, inductive hierarchies, spiders or webs, and free forms, or structures of the student's or teacher's devising. These types of schemata are illustrated in Figures 1, 2, 3, and 4 respectively.

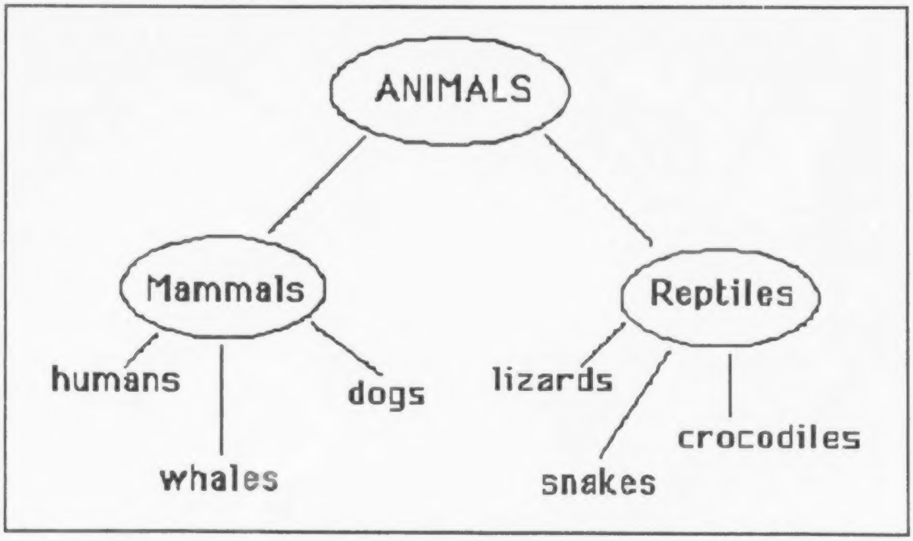

Figure 1 - Hierarchy Schema

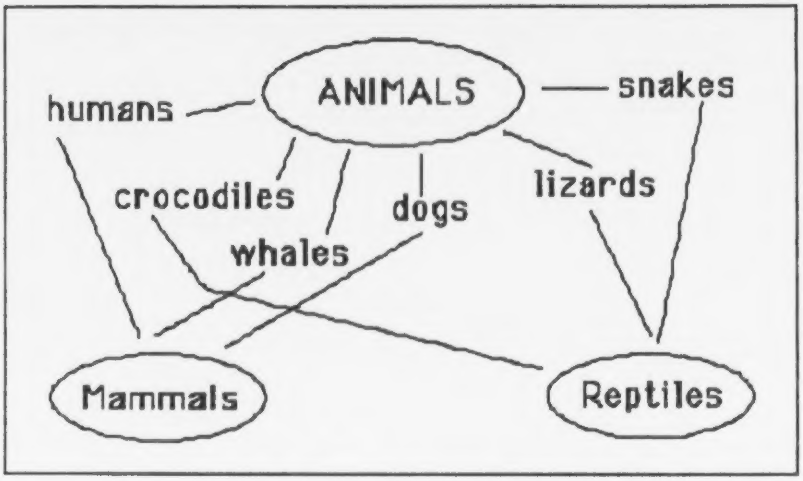
ANIMALS
humans
snakes
crocodiles
dogs
lizards
whales
Mammals
Reptiles

Figure 2 - Inductive Hierarchy Schema

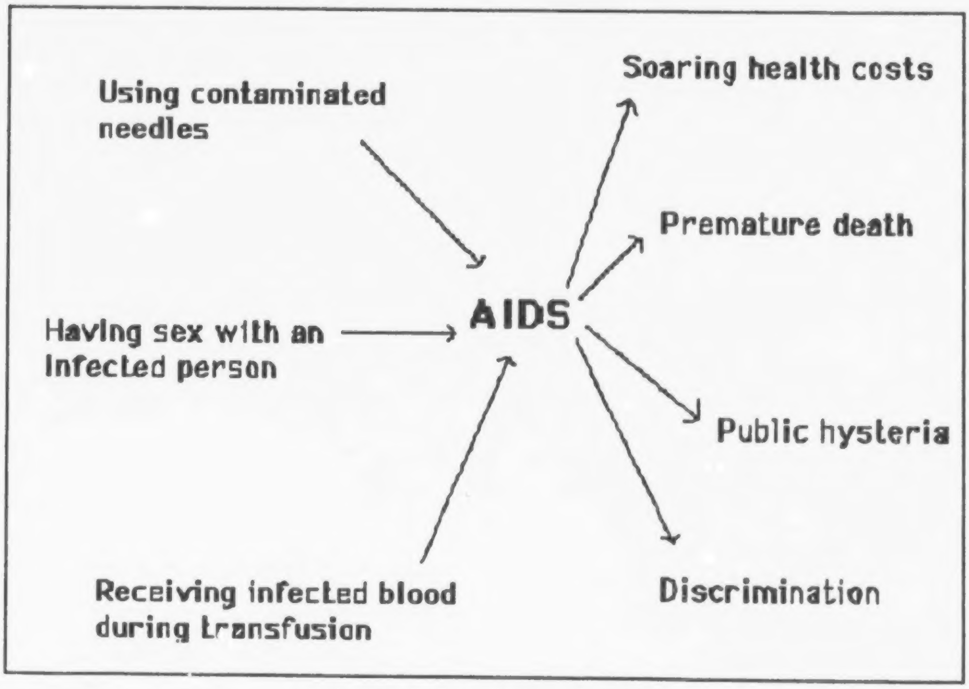
Using contaminated needles
Soaring health costs
Premature death
Having sex with an infected person
AIDS
Public hysteria
Receiving infected blood during transfusion
Discrimination

Figure 3 - Spider Schema

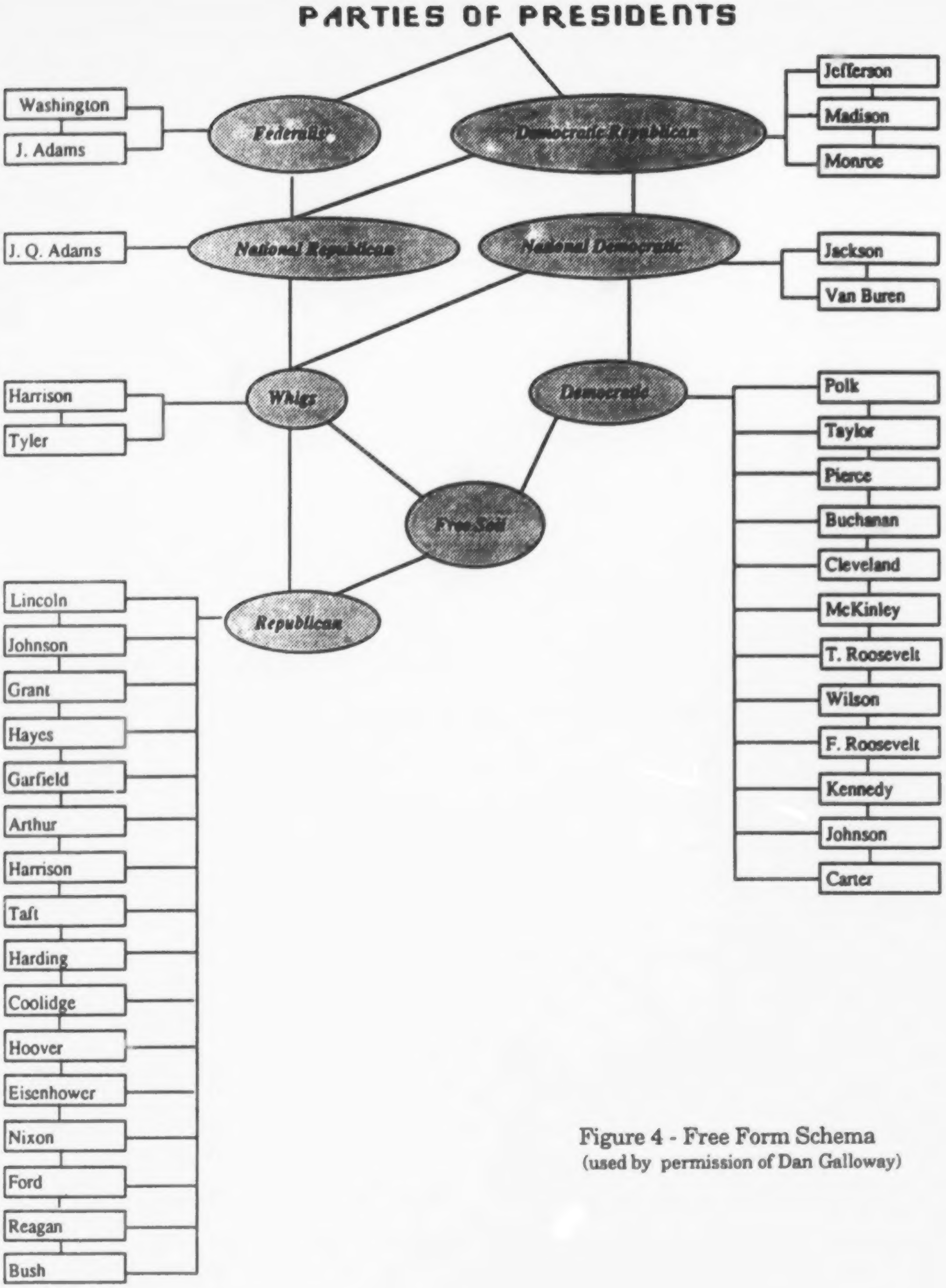
PARTIES OF PRESIDENTS
Washington
J. Adams
Federalist
Democratic-Republican
Jefferson
Madison
Monroe
J. Q. Adams
National Republican
National Democratic
Jackson
Van Buren
Harrison
Tyler
Whigs
Democratic
Free Soil
Republican
Polk
Taylor
Pierce
Buchanan
Cleveland
McKinley
T. Roosevelt
Wilson
F. Roosevelt
Kennedy
Johnson
Carter
Lincoln
Johnson
Grant
Hayes
Garfield
Arthur
Harrison
Taft
Harding
Coolidge
Hoover
Eisenhower
Nixon
Ford
Reagan
Bush

Figure 4 - Free Form Schema
(used by permission of Dan Galloway)

Some instructional applications. The instructional uses of these various schemata are limited only by the imagination of the teacher and her students. To introduce students to schema construction, the teacher might select a current event or other topic familiar to students and soliciting the class's participation, model the process. She would first ask students to brainstorm aspects of the topic and then to identify those aspects which serve as key features. On the blackboard, she might begin to visually arrange the features, encouraging students to discuss, debate, and justify their decisions as to the placement of features and the means of depicting relationships among them.

Once familiar with the process, students are ready to construct schemata, either as an end in itself -- that is, to show relationships and thus, gain a picture of the whole -- or as a vehicle for further learning. Following are suggestions pertaining to the first purpose:

- As homework, students might construct schemata showing understanding of reading assignments.
- Prior to lectures and other relatively passive activities aimed at the acquisition of information, the teacher might provide students with skeletal schemata as advance organizers, with only the most general and inclusive key aspects filled in, and ask student to fill in more particular features as the exercise progresses. In so doing, students would be actively involved in activities which normally require only nominal involvement.
- On a larger scale, the teacher might post a similar skeletal schema for an entire course, to be completed as the semester or year wanes. Such a constant, ever visible representation likely would facilitate students' organization and retention of what might otherwise seem an unwieldy amount of knowledge. In addition, periodic review and revision of past contributions would aid students in coming to important realizations about the nature of knowledge -- that it is tentative and that its relationships are subject to change with the acquisition of new information.

Following are suggestions for using schemata as tools for further learning.

- In order to analyze current events, students might construct schemata showing cause and effect relationships. These relationships might extend beyond the past and present into predictions about future, related events. By using schemata in such a fashion, students might arrive at an understanding of the global consequences of seemingly localized events. In reviewing and revising contributions as the event unfolds, students also might gain similar insights about the nature of knowledge highlighted in the previous activity. Further, students might use the understanding gleaned from these schemata to deliberate solutions to the problems posed by current events.
- To stimulate analogical thinking, the teacher might derive partial analogies from already constructed schemata for students to complete

and encourage students to devise their own. Examples drawn from the schemata in Figures 1 and 3 include:

dog : mammal :: crocodile : reptile
member : group :: human : mammal
*contaminated blood transfusions : AIDS :: _(cause)_ : _(effect)_*

- As an introduction to writing papers of comparison students might construct separate schemata for two or more entities -- be they concepts, countries, or characters -- and then attempt to connect them. With relationships and dissimilarities graphically apparent, students would be in a position to devise comparison charts, which, in turn, could be used to write their papers.

A consideration of benefits. As evidenced by the foregoing examples, many of the cognitive benefits of schema construction depend upon particular applications. However, the most pervasive advantage is the perception of relationships which might not have been as apparent in less visual representations of knowledge -- the transformation of a welter of information into a nexus of knowledge. Marzano et. al. (1988) underscore the "aha!" potential of schema construction by stating that graphics:

> - ... can be used to synthesize complex information from diverse sources efficiently, helping students to identify patterns and relationships that are otherwise difficult to apprehend.
> - ... help the user to generate information about the structure and relationships among parts that may not have been clear in the original, nongraphic information (pp. 86-87).

Other potential cognitive advantages inhere in schema construction regardless of its particular instructional applications, including:

- allowing the use and encouraging the development of visual and nonlinear styles of learning and thinking;
- encouraging students to build upon, revise, and refine existing, internal schemata;
- facilitating the organization of knowledge, which, in turn, probably leads to improved retention and enhanced accessibility and retrievablity of information in problem solving; and
- encouraging metacognitive thinking. It is likely that in analyzing their organization of knowledge, students think about their own thinking.

While schema construction brings to mind several advantages for the student, it holds promise for the teacher as well:

- It is possible that students from diverse cultural and socioeconomic groups possess qualitatively different internal schemata. By encouraging her students to externalize these representations prior to instruction, the teacher can accumulate a wealth of information pertinent to the background of her students. Thoughtful interpretation of these data can provide the teacher with direction in planning instruction.
- In a similar vein, the teacher can use these early schemata to gain insight into students' initial conceptions of material to be covered. When detecting faulty connections, the teacher can parlay her insights into diagnostic tools.
- By requiring students to construct schemata periodically throughout a unit of instruction, the teacher has in hand a means of formative evaluation to guide subsequent instruction.

Some research questions. From these proposed benefits to students and teachers, a number of research questions spin off:

- To what degree does the use of graphic organizers strengthen visual and nonlinear styles of learning?
- Does schema construction indeed facilitate a high degree of organization of knowledge bases?
- Does such organization promote retention, accessibility, and retrievability of information?
- To the extent that the previous two questions can be answered in the affirmative, does schema construction contribute to improved problem solving performance?
- Does schematic thinking in one area transfer to schematic thinking in another? If so, what are the mechanisms by which transfer takes place? What can teachers do to facilitate transfer?
- Do schemata devised by students of diverse cultural and socioeconomic backgrounds differ in major, qualitative ways? If so, what are these differences, and what do they tell the teacher about the cultures from which her students derive?

The conclusion. If one is not careful, "thinking in schemata" becomes a habit. That is, once adept in the process, the practitioner may find that visual representations permeate her thinking in an almost self-generative fashion. One instructional idea leads to another which suggests yet another which connects to the first, and so on. A multiplicity of relationships -- among both instructional ideas and subject areas -- reveals itself. And from these relationships spring possibilities for research, followed soon after by attendant schemata concerning research methodologies. Or perhaps research comes first ...

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Using Children's Book Illustrations to Teach Visual Literacy

Nancy L. Chu
LaVonne Sanborn

We live today in a microwave society. We eat fast food, perform as many necessities as possible at the drive-through window and hurry on to the next task. Processes that require time for perusal and contemplation are often pushed aside as too time-consuming for now. However, later never seems to arrive. In this hurried atmosphere, teachers are responsible for helping children observe, interpret, question, communicate and criticize in many different subject areas. Among those subjects is literature. Acquiring any understanding of literature defies our society's "microwave mentality."

Educating the Eyes of Pre-Service Teachers

As educators of preservice teachers, we deal primarily with early childhood and elementary education majors. Our students come from both rural and urban backgrounds. While the majority is Caucasian, a sizeable minority is African-American, Hispanic, Native American and Asian. Though our experiences with these students vary from semester to semester, we have been able to make the following generalizations:

1. Students' literary backgrounds are limited. Observations and reactions are often limited to the obvious surface elements of plot events and characters.
2. Theme is treated as being synonymous with "moral of the story". Literature is discounted unless it provides an obvious lesson.
3. Literature that deals subtly with difficult themes and complex characters is often second choice to more transparent, less challenging books.
4. The role of the illustrations is that of decoration and perhaps as a clarifier of unfamiliar textual terms. The fact that the illustrations are also instrumental in creating mood is not recognized.

Nor do our students recognize the power of books to illuminate feelings. An example is *Hiroshima No Pika*, Toshi Maruki's account of the bombing of Hiroshima as seen through the eyes of a child survivor. No textbook discussion of names, dates and casualty figures will achieve what Maruki does in her quiet scenes of a Japanese family at breakfast and the fiery pages that follow. The same is true of *The Faithful Elephants* by Yukio Tsuchya and illustrated by Ted Lewin which describes the deliberate extermination of animals in the Tokyo's Ueno Zoo during World War II to avoid the possibility of their escape should the zoo be bombed. Few books in terms of story and illustration can show the pain felt by the humans who cared for these animals. In books such as these a reader can begin to fathom how lives are changed by seemingly far-away politics.

Fortunately, this lack of in-depth experience with illustrated books is not due to a lack of intelligence or commitment on the students' parts. In presenting these books to preservice teachers, we have observed that they are receptive and slightly in awe of the depth of understanding that can be achieved once they know how to look carefully at an illustration, read and analyze a story and consider the two as a unified whole.

To help these preservice teachers become more adept at recognizing how illustrations enhance literature experiences, we have two goals:

1. To develop our own expertise in the area of visual literacy. By educating our own eyes to observe and interpret elements of an illustration, we are then able to help our preservice students gain the confidence they need in this area.

2. To deepen student response to the books they read. For a teacher it is insufficient to say simply "I like it" or "I didn't like it". Nodelman states that implying that illustrations are primarily pleasant decorations is to underestimate them and assume that they do not challenge the mind nor require much thought.[1] The willingness to go beyond the surface aspects of an illustration to deeper levels of meaning is as necessary as the ability to recognize the efficiency with which the artist has clarified the information contained in the text. Teachers who are observant and evaluative in their responses to the words and illustrations found in literature are more likely to guide children competently toward a more thorough understanding of literature.

Verbal Literacy/Visual Literacy

Visual literacy should be closely associated with verbal literacy--written and oral. Students need to verbalize responses past the four-letter word stage of good, cute, neat or fine. Although awesome, colorful and delightful are more sophisticated words, they still are not sufficiently expressive unless accompanied by descriptors that focus more eloquently on the whys and hows of illustration. "Talk helps with conceiving, elaborating, and refining visual forms and helps students grasp content and feelings that are beyond their normal and accustomed modes, thus helping them develop new insights and novel and vivid imagery"[2].

Perry Nodelman's observation that we see and understand only what we are trained to see and understand is true for adults as well as children[3]. Goldstone supports this when she states that higher order thinking skills--analyzing, synthesizing and interpretation of visual imagery--do not come naturally[4]. Because visual literacy is a learned skill like writing and speaking, we are looking for ways to develop visually literate preservice--and later full-fledged--teachers. Illustrated children's books provide an excellent source of pleasure and inspiration for child audiences; they can be equally successful with adult audiences developing those same skills.

Why Children's Books?

The reasons most often cited for using children's books to promote visual literacy skills are largely administrative. Children's books are relatively inexpensive and readily available when compared with curricular materials or audiovisuals. However, more compelling reasons exist for utilizing children's books in developing visually literate students who communicate ideas confidently.

Children are drawn to books which are created expressly for them. The same artistic media and elements used in picture books are used in gallery art. While children form a peripheral audience to adults for gallery art, they experience ownership in picture books that do not condescend but rather meet them with respect. To use these books effectively, preservice teachers must understand the appeals of the illustrations as well as their strengths.

Toward a Systematic Approach to Visual Literacy

To teach visual literacy John Warren Stewig proposes a sequential three-step approach starting with the basic observational level where students are asked to describe content. The second level builds on the first by asking students to compare different illustrations based on what they have observed. The third level involves the student valuing one illustration over another and supporting those opinions[5]. While Stewig's research has been conducted with elementary age children, we have found that a similar approach works with preservice teachers.

Author Signatures and "Trademarks"

While adults may have more visual experience, they must be reminded of the need to observe closely. Our opening exercise is similar to Storey's "Detecting and Selecting Details" and involves the use of illustrative signatures to help students observe detail[6]. For example, in his illustrations Donald Crews hides his daughters' names--Amy and Nina--and the year during which the artwork for the book was completed. He also draws portraits of himself and tucks in visual references to earlier books in illustrations. Marc Brown's signature includes hiding the names of his three children Tucker, Tolon, and Eliza in his Arthur series.

Chris Van Allsburg's trademark is a bull terrier named Fritz who first appeared in The Garden of Abdul Gasazi published in 1979. Though later Van Allsburg books do not include the same characters, close examination of Two Bad Ants reveals Fritz swimming in the soup of a garbage disposal. In The Polar Express, a Fritz hand puppet perches on a bedpost. Steven Kellogg uses the same hidden character signature concept in How Much Is a Million when he hides Pinkerton, a character from an earlier series. Following his Kate Greenaway medal for Gorilla, British illustrator Anthony Browne hid a gorilla in many of his later illustrations.

One of the appeals of literature is the invitation to meet a writer-creator[7]. Searching for an author's visual signature has the added benefit of personalizing literary experience for children and adults. This can be extended to other types of observational opportunities. Two that we commonly use in class are Ann Jonas's inclusion of her husband Donald Crews's portrait in The Trek. Illustrator Don Wood uses his son as a model for the harried page in King Bidgood's in the Bathtub.

Another "Detect and Select" exercise uses books that present the reader with a puzzle to be solved based on prior literary and visual experiences. Each Peach Pear Plum by Janet and Alan Ahlberg presents the reader with a clue hidden in a riddle-rhyme. Based on this clue, the reader then finds a hidden figure in a subsequent illustration. The familiar figures are drawn from nursery rhymes and traditional folk literature. We Hide, You Seek by Jose Aruego and Ariane Dewey is an example of a book that requires the reader to find hidden animals. These are two of many available titles. Others may be located in the library catalog under the subject heading "Hide-and-Seek" or "Visual Perception."

Starting Before the Beginning

Close inspection of a book should focus on more than the illustrations found in the main body of the book. "The reader who approaches a picture book by starting with the first page of the text may be missing some of the important contributions of creative book design."[8] For example, the endpapers may contain the actual start of a story; the reader who bypasses them may not only be missing part of the story but also the illustrator's initial steps in creating atmosphere and a mood. The endpapers of Steven Kellogg's Paul Bunyan begin the story well before the first page of text by showing baby Paul's enormous size and strength at birth. The dazed and bewildered expressions on his parents' faces foreshadow the humor of the story to come.

The endpapers of Noah's Ark by Peter Spier show Noah's tranquil life in the midst of danger. This nearly-wordless book's endpapers are particularly unique because of the inclusion of a few words of text which quote a Biblical passage that states God's grace and affection for the righteous Noah. The half-title and title pages show the construction of the ark, and when the reader reaches the first page of the main body, Noah is shown beginning the process of loading the animals. Noah's story is completed on the final endpapers which also contain a few words of text from the Bible.

In Up to Ten and Down Again, a wordless counting book by Lisa Campbell Ernst, the first endpapers feature a duck swimming through the water from left to right leaving distinct ripples in his wake. The title page introduces other characters--exuberant picnickers whose cars unload increasing numbers of people, animals and equipment. As the activity increases, the Number 4 illustration shows the duck actually swimming out of the illustration into the border. The illustration for Number 5 shows the duck standing outside the picture, looking back with open bill indignantly quacking at the noisy picnickers. The story peaks at Number 10 with the appearance of storm clouds. As the picnickers frantically repack their scattered paraphernalia, the ubiquitous duck watches from the borders. When the numbers have counted down to one and the scene is quiet once more, the duck reenters the illustration and swims off contentedly. The story concludes on the final endpapers as the duck is joined by a flock of friends.

Stories may also begin on the half-title and title pages. The story Have You Seen My Duckling? by Nancy Tafuri begins immediately on the title page with the departure of the recalcitrant duckling from the nest. The sparse text consists of the repeated question first asked in the title. As the mother searches throughout the pond environment, the runaway duckling is visible only to the reader who can find it on the periphery of the pages. Another example is in the cartoonlike illustrations of There's a Hole in the Bucket. The title pages include the only words of text that are not part of the familiar song. Omitting the title page cancels part of the humor of the story as well as a portion of each character's personality. In Wilfrid Gordon McDonald Partridge by Australian author Mem Fox, a small boy introduces the reader to six residents of an "old people's home". However, the reader has already met those characters visually on the half-title and title pages.

Famous "Mistakes"

The observation stage can also lead to interesting discoveries which point out the human errors to which even the best authors, illustrators and editors fall prey. The most famous error which children delight in detecting is Ludwig Bemelman's depiction of "twelve little girls in two straight lines" in Madeline. Though this line and illustration are repeated several times correctly in the story, the error occurs when an illustration depicts twelve little girls--only Madeline should be missing having been hospitalized with an attack of appendicitis.

In Robert McCloskey's Homer Price, the chapter "The Case of the Sensational Scent" tells of four robbers who have fled to the woods with their loot. An illustration shows four robbers trying to shave before a palm-sized mirror hung on a tree. A later illustration shows the robbers jammed uncomfortably into a bed only now there are five of them. Cover art does not nor should it escape the visually literate reader's scrutiny. The Bears Upstairs by Dorothy Haas contains a detailed description of Ursula Ma'am, a well-dressed bear who is entering the hotel lobby. Her fashionable hat is veiled. However, in a paperbound edition published by Scholastic, her face is uncovered, a discrepancy detected by a group of fourth graders.

Visual Literacy and Literary Elements: Plot Devices

While the observation stage may focus largely on detailed picture content, teachers may also choose to discuss artistic elements such as line, shape, composition, color and perspective. A valuable resource for the non-artist teacher is "Reading Pictures: Exploring Illustrations with Children" created by John Stewig.[9]

However, as literature teachers, our focus is primarily on literary components and how authors and illustrators use them. By recognizing the effect of illustration in revealing literary components, we are moving toward Stewig's second and third stages of visual literacy--comparing and valuing.

Plot is perhaps the most obvious literary component. When asked about a book, a reader regardless of age generally recounts the plot. Subtleties of plot structure are present in illustrations, and readers who are aware of these visual devices can begin to look for them conscientiously. How an author/illustrator chooses to show the passage of time is an example. This is evident in the classic Goodnight Moon by Margaret Wise Brown, a gentle rhyming story of a small rabbit saying goodnight to all the things in his room. Illustrator Clement Hurd gradually darkens the room as time passes. An added invitation to curious and observant readers is the presence of a tiny mouse who hides in a different spot in each illustration. Three more recent titles that use light to signal the passage of time are The Napping House by Audrey and Don Wood, Dawn by Uri Shulevitz and Grandfather Twilight by Barbara Berger.

A recent trend in illustration is the use of borders to heighten plot action, reinforce the content of the illustration or give clues as to what subsequent illustrations may contain. In A Chair for My Mother by Vera Williams, a small girl tells of her mother's job at the Blue Tile Diner. The page containing the illustration of the diner is bordered with irregular squares of bright blue mosaic tile. When a fire guts their apartment destroying all their furniture, the illustration is bordered with flames.

In Little Red Riding Hood Trina Schart Hyman uses borders reminiscent of folk art to reinforce the homey, rural atmosphere of the story and to set the stage for the rough-hewn characters of the wolf and the woodsman who appear later in the story. Teachers will also want to guide readers to the book which Red Riding Hood is reading in the frontispiece. The reader is also introduced to the black cat who will surreptitiously follow his small mistress throughout the story.

The Mitten, a folktale adapted and illustrated by Jan Brett, contains borders which give clues as to what each following illustration will contain. For example, a hedgehog who first appears in a border is the next animal to force his way into the ever-expanding mitten. Each animal is introduced in the text of the facing page and featured on the following illustration.

Visual Subplots

As a literary device subplots are as visual as they are verbal. In Charlie Needs a Cloak by Tomie DePaola, a shepherd goes through the steps necessary to produce a new garment to replace his worn one. As Charlie shears the sheep, cleans, dyes and spins the wool, then weaves and sews the fabric, a mouse is busy stealing various objects to take to his tree-stump home. Only on the last page does the reader learn where these objects are being taken and for what purpose.

In Rain Makes Applesauce, Julian Scheer creates a nonsense rhyme. Illustrator Marvin Bileck includes a visual subplot in a more literal vein by showing the step-by-step process followed by two children who plant and nurture an apple tree. Night Noises by Mem Fox features three complete stories on each double-page spread. In the central plot, an elderly woman dozes while noises outside her door disturb her dog. This primary plot is shown in large proportion in the middle of the double-page spread spanning the gutter of the book. The illustrations to the right reveal the woman's dreams as she naps in her chair. The illustrations on the left show what is happening outside her door to produce the "night noises". These noises startle her awake to find her friends and relatives waiting with a surprise birthday celebration.

Plot Action

Plot action can also be influenced by the format of the book. The endpapers of Toshi Uchida's Elephant Crossing with their silhouetted animals are reminiscent of a crowded waterhole. The plot unfolds around a herd of elephants as they move toward a forest to feed. Stalking them are several lions. The rectangular illustrations and horizontal lines of the plain are broken abruptly as the reader turns the page to see that the lions have moved too close to the alarmed herd. As the matriarch charges the intruders, the reader must turn the book from a horizontal to a vertical position.

Another book which presents a visual surprise is Ann Jonas's Round Trip which uses an optical illusion approach to the illustrations. In this story a trip to the city is described. On what the reader would naturally assume is the last page, the trip is only half complete. At this point the book must be turned over and both text and illustrations tell the story of the rest of the journey. A book for younger readers by the same author invites observation and comparison to the readers' own experiences. Jonas's Where Can It Be? traces a child's search through the house for an unknown object. Die-cut pages illustrating doors and bedclothes are lifted to reveal the objects behind them though not the mystery object.

Plots based largely on quiet events are also reinforced by details of illustration though they may be very subtle and readers must be alert to see them. An example is John Brown, Rose and the Midnight Cat by Australian Jenny Wagner, a gentle story of "sibling rivalry" between an elderly woman's dog, John Brown, and a stray cat. Their dignified existence is shown in an early illustration with Rose and John Brown sitting together. Many readers, while enjoying the picture of the affectionate pair, would not readily see the multiple meanings of "rose": the rose-sprigged wallpaper, the delicate rose-colored draperies and the main character's name.

Point of View

Point of view can also be considered visually as well as through story text. Children gradually come to understand point of view as a literary element as they are exposed to more stories and become adept at recognizing from whose point of view the story is told. They can also learn to distinguish between different narrators and when points of view shift within a story. Illustrations can be an effective introduction and reinforcement to the concept.

In Cat and Canary, British illustrator Michael Foreman shifts the visual point of view in the course of the story. The reader is the primary observer of the story in which a cat hitches a ride on a kite and flies over a city of skyscrapers and busy streets. The point of view shifts in the middle of the book to that of the cat as the reader looks down to the concrete below and sees a huge, cat-shaped shadow. In Two Bad Ants, Chris Van Allsburg shows the reader the world from an ant's eye view--in this case, a journey through a kitchen. Though the reader is aware of the setting, Van Allsburg never reveals the actual location of the safari-like journey in the text but relies on illustrations to describe the dangers.

Valuing What One Sees

While observation and comparison are essential, the last step of Stewig's three-step approach to visual literacy training is the goal--that of valuing what one sees. Expressing and supporting an opinion based on observation and comparison is a step that is sometimes never reached. Unfortunately, teachers who do not recognize the importance of the final stage overlook a natural and fertile ground for fostering critical thinking. Taking several versions of a single tale is one means for encouraging students to engage in all three steps. For this purpose folk literature is an excellent choice. It is not difficult to find at least two versions of a single familiar tale illustrated by different artists. Another advantage is that the characterization is largely visual rather than verbal. The wolf in "The Three Little Pigs" is an example of a character who appeals to the reader and who, depending upon the artist, can take on different personalitiies.

Perhaps the most familiar and unmistakably cartoonish wolf is from the book based upon the Walt Disney movie. Aurelius Battaglia's book is more polished than the mass-market Disney version though his wolf retains similar details of dress--scraggly clothing with a cast-off appearance. However, Battaglia's illustrations are decidedly more detailed than the movie-based version with the wolf shown as a yellow-eyed, toothy threat to the pigs. His fur is more realistic, his feet knuckly and scrawny while Disney's wolf's fur has a patent quality and his feet are paddle-like. Margot Zemach's wolf is a gentleman fallen upon hard times and driven to desperate measures. His top hat and frock coat are frayed. At first glance, his face is less menacing though he is no less a threat to the pigs.

Other versions of the story present more contemporary interpretations of the wolf. While their plots are more faithful to the old English folktale, Gavin Bishop and James Marshall present readers with characters whose appearance is different from the three previous versions. Bishop's wolf is stylishly dressed in a jacket monogrammed prominently with a capital W. His features are partly hidden by his Walkman and sunglasses but his teeth are still in evidence. James Marshall's wolf is a sinister man about town who leans against a bicycle and surveys his next meal.

Like many folktales, "The Three Little Pigs" has not been confined to its native England. William H. Hooks's version is based on tales heard in the Great Smoky Mountains. The wolf is now a fox but no less a menace to the pigs. In keeping with the rural setting, he wears overalls and a bandanna. But perhaps the most unique approach to the familiar tale is Jon Scieszka's The True Story of the Three Little Pigs! Lane Smith's wolf is skewed and disproportionate with tiny eyes and teeth. His paws have a delicate quality though his dietary habits are distinctly wolf-like. Though he would have you believe otherwise, this wolf is just as dangerous as his colleagues in other versions. While comparison of these illustrations starts with observation of the illustrative details, teachers must guide students through the valuing stage by asking about the mood created in each story, how each depiction makes the reader feel, why the illustrator selected a certain personality for the wolf and finally which depiction they like best and why. Discussion opportunities such as these will help spur the necessary verbal responses, but these opportunities must be created rather than left to chance.

Visual Literacy: Still a Need

In a speech before the New York State Library Association, illustrator Marcia Brown said: "A child can and must be trained in visual awareness if he is to become an aware adult. For the city child there is the staccato excitement of geometry, subway lights, neon signs, sharp contrasts of light and shade, mass groupings of buildings and humanity. Human warmth becomes even more precious in such an atmosphere. For the country child there are the subtle curves of landscape, a close-up of seasonal changes, the design of plant forms, a chance to observe the relationships of the parts of nature to the whole. Each child can be taught to enlarge his horizons."[10] This statement was made in 1949 and is still true forty years later. Illustrated children's books are among the tools teachers can use to enlarge horizons--their own as well as those of the children they teach.

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